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DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

WATER RESOURCES

OF THE

KENNEBEC RIVER BASIN, MAINE

BY

H. K. BARROWS

WITH A SECTION ON THE

QUALITY OF KENNEBEC RIVER WATER

BY

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CONTENTS.

ILLUSTRATIONS.

WATER RESOURCES OF KENNEBEC RIVER BASIN.

By H. K. Barrows.

INTRODUCTION.

Kennebec River with its important tributaries furnishes some of the best water power in the country, besides affording many excellent sites for further development. In extending in the best manner the use of this river and its branches for water power, for log driving and lumbering, and for municipal and other purposes, the welfare of the whole State of Maine is vitally concerned. A large amount of information of value in the study of this drainage basin has been gathered at various times, but much of it is scattered through various manuscripts and reports and is not readily accessible. This paper has been prepared in response to the constant demand for this information from both engineers and the public. Especial attention has been given to the subject of water storage, as this is of the utmost importance to present and future users of the water and the natural opportunities for regulating and improving flow in this basin are exceptionally good.

As a result of cooperation between the Maine State Survey Commission and the United States Geological Survey, the main river from Skowhegan to The Forks was surveyed during 1904, and surveys of various lakes and ponds in the headwater region were made during 1905–6 by the National Survey. The following plans and profiles will be furnished to persons especially interested in the subject on application to the Director, United States Geological Survey, Washington, D. C.:

Plan and profile of Kennebec River from Skowhegan to The Forks.
Plan of Brassua Lake.
Plan of Brassua Lake Outlet.
Plan and profile of Moose River between Moosehead and Brassua lakes.
Plan of Wood and Attean ponds.
Plan of Wood Pond Outlet.
Reconnaissance plan of Holeb Pond, Long Pond, Lower Roach Pond, Middle Roach Pond, Flagstaff Lake, West Carry Pond, Spring Lake, and Spencer Ponds.

Topographic maps[a] of a large portion of the Kennebec basin have

[a] These maps may be obtained for 5 cents each by addressing the Director of the United States Geological Survey, Washington, D. C.

been published by the United States Geological Survey. The unit of survey adopted is a rectangular area bounded by meridians and parallels. Such an area is known as a quadrangle and in Maine is 15 minutes in extent each way and has an area of one-sixteenth of a square degree. The quadrangles disregard political boundaries such as those of States, counties, and townships. To each is given the name of some well-known place or feature within its limits. The areas surveyed in the Kennebec basin and the names of the quadrangles are shown in fig. 1.

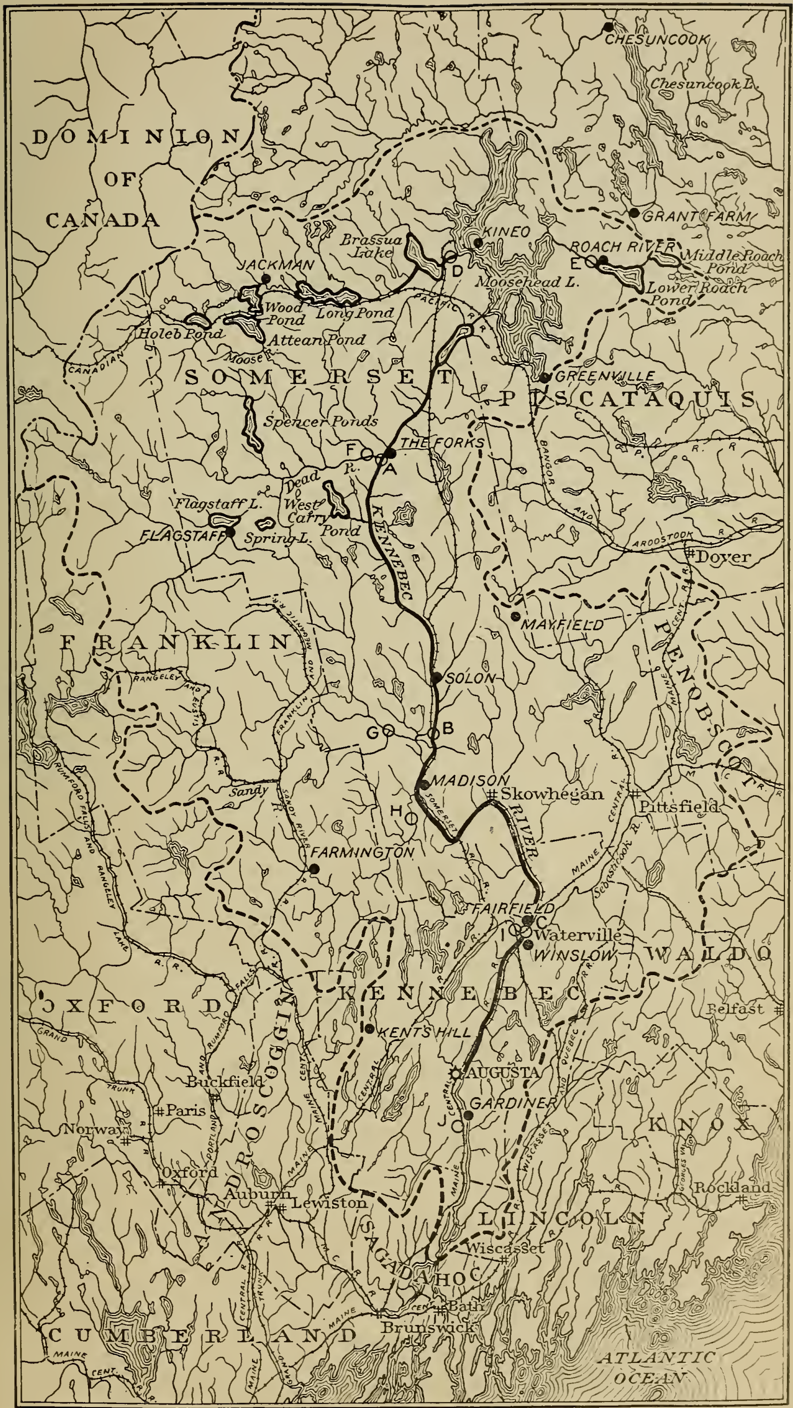
The present report has been compiled chiefly from the records, reports, and maps of the United States Geological Survey, although much valuable information has been furnished by private parties. Primarily this report is made possible at this time by the cooperation of the State of Maine, through its State Survey Commission, Messrs. Leslie A. Lee, chairman; Charles S. Hichborn, secretary and treasurer; and William Engel. Special acknowledgment is also due to the Hollingsworth & Whitney Company, of Waterville, through F. E. Boston, agent, and James L. Dean, engineer, for data on flow at Waterville, on Moosehead Lake, and on floods in Kennebec River; to the Kennebec Water Power Company, through W. H. K. Abbott, secretary and treasurer, and Fred T. Dow, engineer, for much information regarding Moosehead Lake and Kennebec River; to the Kennebec, Moose, and Dead River Log-Driving Companies, through S. W. Philbrick, secretary and treasurer, for information regarding log driving, improvements of river, etc.; and to Prof. A. D. Butterfield, of the University of Vermont, who gathered much of the new matter for this report.

GENERAL DESCRIPTION OF BASIN.

PHYSICAL CHARACTERISTICS.

Kennebec River rises in Moosehead Lake, in the west central part of Maine, the headwaters being collected by Moose River, Roach River, and a number of smaller streams rising in the hilly, forested areas east and west of the lake. The drainage basin (Pl. I) extends from the Canada line to the ocean, measures about 150 miles in length, varies in width from 50 to 80 miles in the main portion, and embraces a total area of 5,970 square miles (about one-fifth the total area of the State), of which 1,240 square miles are tributary to Moosehead Lake. The length of the river from the lake to the entrance of Merrymeeting Bay, including the more considerable windings, is about 140 miles.

The northern part of the drainage basin is broken by offsets from the White Mountains, and nearly the whole upper portion is forest covered and in its original wild state. Near Moosehead Lake the hills and highlands lie well back from the lake, leaving a great open



A ○ River gaging stations
● Precipitation stations

0 5 10 20 30 miles

---- Drainage boundary
━━ River and Lake surveys

MAP OF KENNEBEC DRAINAGE BASIN.

Showing gaging and rainfall stations and river and lake surveys.

plain; below the outlet of the lake into the Kennebec the hills close in on the river, forming a narrow, rocky chasm, with steep, precipitous

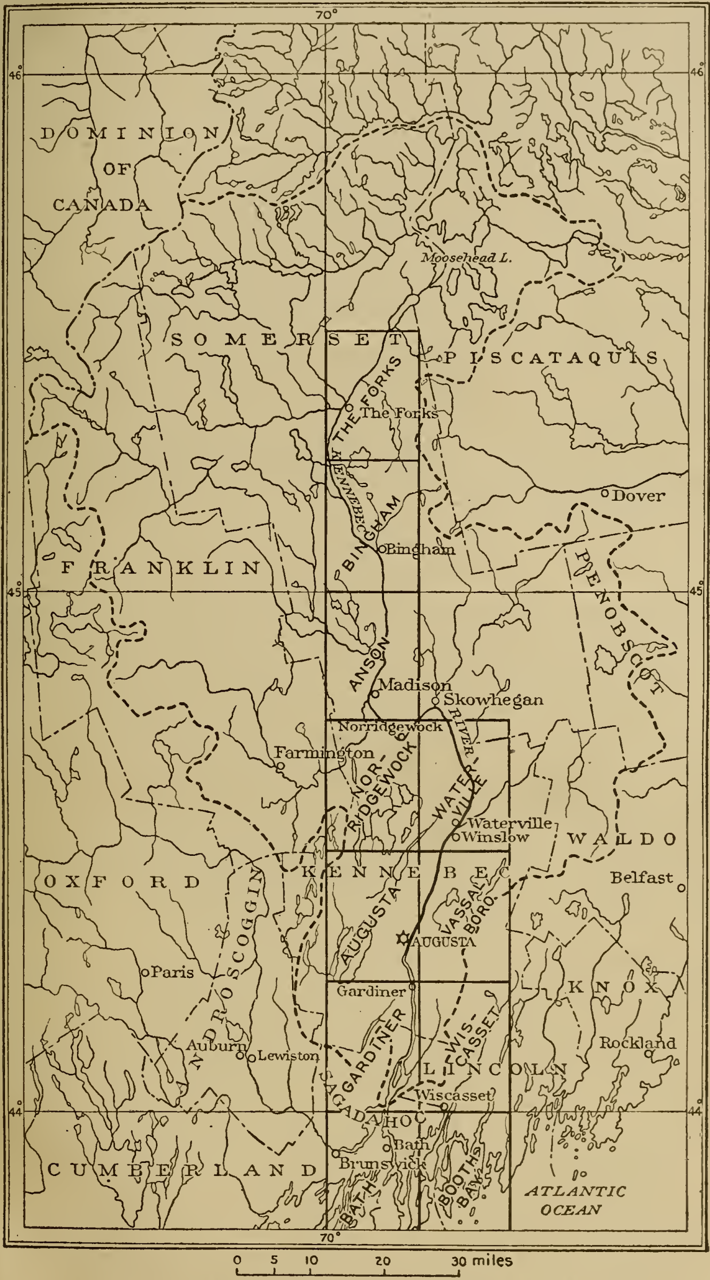


Fig. 1.—Map of Kennebec basin, showing area mapped by United States Geological Survey.

sides. From Moosehead Lake to the upper end of Indian Pond, a distance of about 4.5 miles, there is a fall of about 90 feet; this being a very rough, rocky, and turbulent part of the river. Indian Pond varies in width from a few hundred feet to about three-fourths of a mile, and has a total length of about 5 miles. It has two levels, separated by a short stretch of rapids at the "narrows," about a mile from the upper end of the pond, where there is ordinarily a fall of about 5 feet. From Indian Pond to The Forks the river is a torrent, falling over a rough and rocky bed more than 350 feet in a distance of about 15 miles. Below the Forks, where it is joined by the waters of Dead River, the Kennebec flows through a broader valley whose gentler slopes are still covered to some extent with forest growth. About 60 miles from the coast the hills again rise, though not to any considerable height. The general elevation of the basin is less than that of the Androscoggin, which adjoins it on the west, though near the center of the area Saddleback, Abraham, and Bigelow mountains rise as isolated peaks to an elevation higher than any mountains in the State except Katahdin.

The fall of the river from Moosehead Lake to the head of tide water at Augusta is 1,026 feet, the distance being 120 miles and the average descent 8.55 feet per mile.

GEOLOGY.

By George Otis Smith.

The water resources of a drainage basin are to a large extent dependent on the geology of the area. The geologic factors that are of prime importance in influencing the present drainage conditions of the Kennebec basin are the rock structure and the processes of land erosion that have produced the present configuration of the surface, which represents one stage in the topographic development as shown by the amount of relief and its details. All of these details are the products of past geologic processes and constitute the record of geologic history. Most, if not all, of these conditions directly affect the character of the drainage system and largely control the availability and permanence of its water resources, thus showing the intimate relation between the geologic work of the past and the industrial activity of the present.

The Kennebec basin presents considerable variety in its rock formations. In the northern part of the basin the rocks are of later Paleozoic age and include sandstones, conglomerates, shales, slates, and impure limestones, these sedimentary rocks in several localities being fossiliferous. Within this area there are also some masses of volcanic rocks, of which the porphyritic rhyolite of Mount Kineo furnishes the most conspicuous exposure. The sedimentary rocks of this portion of the Kennebec basin have a general northeast-southwest trend, but it is not known that the geologic structure has any marked influence on the topography except where certain more massive and resistant strata may control the position of minor ridges. To the northwest the divide between the Kennebec waters and the drainage of the Chaudiere is probably determined in part by the presence of some older schists which have withstood erosion more effectively than the sediments of the Moosehead region.

South of The Forks the rocks of the Kennebec basin include roofing slates similar to those quarried in Piscataquis County, other argillaceous rocks, impure limestones, and calcareous sandstones. Associated with these sedimentary rocks are several areas of intrusive granite, the largest of which is on the headwaters of Dead, Carrabassett, and Sandy rivers. The general trend of the formations in this part of the basin is also northeast and southwest, and the river gorge cuts across several ridges whose position appears to be determined by rock structure.

South of Augusta the rocks are sedimentary in origin and were once similar to those just described, but have been altered into slates, schists, and gneisses, which are thoroughly impregnated with pegmatitic and granitic material. So complex is the character of this widespread intrusion that in many places it is difficult to distinguish between the schist or gneiss and the granite. The quarries at Hallowell are located on one of the larger masses of pure granite.

A noticeable characteristic of all the rocks mentioned above is their compactness and hardness. Not only is this due to their age, but more especially to the degree of their alteration. During the ages that have elapsed since their deposition they have undergone important changes by which soft mud rock or shale has been metamorphosed into crumpled schist, and loose-textured sandstone into flintlike quartzite. This has been effected both by the intrusion of large masses of molten granite and by the folding of beds that were originally horizontal but are now steeply inclined. Similar rock folds characterize deeply eroded mountain masses, and here the rocks may have been elevated into ridges. Of these ridges the lower portions alone remain, and any suggestion of their existence is furnished only by the closely folded beds of rock that line the stream bank in so many localities.

These hard and compact rocks give to the present channels of the Kennebec and its principal tributaries a permanence which they might not possess if the rocks were softer. The complicated structure of the rocks and the consequent alternation of relatively hard and soft beds control to a large extent the abrupt changes in the grade of the streams where rips and falls succeed quiet reaches.

The topography of the region drained by Kennebec River is the resultant of a long-continued process of erosion or land wear in which normal weathering and stream work have been the most important elements. The agency that has been most active in the production of the present land forms is running water, and the topography of the basin is to be considered as largely the product of the activity of Kennebec River and its many tributary streams. Glacial erosion and deposition have also contributed to the production of the present land surface, with the result that in certain areas the relief in its details is due largely to glacial processes rather than to river work.

The differences between the topography of this region at the beginning of the Pleistocene or glacial epoch and that at its close are doubtless great and are of special interest in the present connection. It is probable that before the first invasion of the ice the hills and mountains of this basin rose more abruptly above the valleys, and that the Kennebec and its principal tributaries meandered over relatively wide valley floors instead of being confined between terraces as at present. In the valleys firm rocks were exposed in few places, probably, and residual soils and clays formed a deep cover where to-day there are ledges of solid rock or benches of gravels, sands, and clays. The first effect of the occupation of the basin by the ice sheet from the north was the planing away of the decomposed rock and the smoothing down of the outlines of the hills and mountains. A consequence of this planing action of the ice is the presence to-day of firm rock foundations that afford opportunity for the erection of mill structures and dams whose safety is insured against destruction by freshets.

The detritus produced by this glacial erosion furnished in turn the material transported in the ice and the mass of gravel, sand, and finer material transported by the streams flowing on the surface of the glacier, beneath it, or over the land surfaces beyond its margin. All this material was deposited at various points within this area or in the submarine extension of this basin. The subsidence of the land during the later stages of the glacial epoch caused an advance of the sea northward along the Kennebec Valley to a distance of 100 miles or more from the present coast line. In the quiet waters of the estuary thus produced the glacial streams deposited their loads, and from these deposits have resulted many of the present topographic forms, such as the terraces, sand plains, and kettle basins, which are familiar to those who traverse the Kennebec Valley. The glacial deposits, however, affect more than the scenery. The preglacial Kennebec drainage system was greatly altered, and not only were old channels filled with bowlder clay and with glacial gravel and sand, but the streams, thus diverted at a time when their volume and load were greatly increased by the contribution from the melting glacier, were compelled to cut new channels, which in many cases followed courses quite different from the old. This resulted in the transfer of drainage from one river system to another and, what is more important, the creation of waterfalls. The stream, thus forced to abandon a valley that probably was relatively wide and possessed a moderate grade, now cuts across a rock divide, where it develops a waterfall. When the drainage history of the Kennebec basin is thoroughly worked out it will be found that there have been many such stream diversions, which have resulted in the development of water powers that now constitute one of the most valuable assets of the State.

One of the more conspicuous cases of probable stream diversion that can be cited is that of Sandy River. This stream flows almost due north where it enters the southward-flowing Kennebec a short distance below Madison. This abnormal relation between the two rivers points to the existence of diversion, and it seems probable that in preglacial time the drainage from the Sandy River basin flowed in a different direction and entered Androscoggin River in the vicinity of Jay. Through obstruction of the lower course of the Sandy by glacial deposits the channel south of the present site of Farmington seems to have been abandoned and the stream forced to seek an outlet to the east. The position of the abandoned portion of the Sandy River Valley is indicated in the present topography, and like many other such abandoned valleys this one has been utilized by the railroad engineer, being followed approximately by the Farmington branch of the Maine Central. The water powers at Farmington and Farmington Mills may be regarded as owing their origin to this stream diversion. It is also possible that a part of the present drainage basin of Dead River was once tributary to the Sandy, but was likewise diverted by glacial deposits during the retreat of the ice. This supposition is based principally on the abnormal course of the lower part of Dead River and the presence there of rapid water and falls, in strong contrast with the upper reaches which give the name to the river.

Not only are there in the Kennebec basin such cases of diversion of former tributaries of other river systems as that just cited, but the Kennebec itself seems to possess a somewhat complex character. It now occupies portions of the valleys of streams that were formerly tributaries. There is reason to believe that the portion of the Kennebec north of Norridgewock formerly flowed more nearly southward from that point and united with the drainage of Wesserunsett and Carrabassett streams and Sebasticook River at some point south of Waterville. If this is true, then that portion of the Kennebec between Norridgewock and Skowhegan, with its abnormal northeasterly course, represents the diversion of the upper Kennebec eastward to the point where it joined the valley of the Wesserunsett below Skowhegan. This change in the river's course can doubtless be attributed to the thick deposits of glacial gravels and sands in the western part of the town of Norridgewock, where in fact the low divide between the streams flowing directly into the Kennebec and those tributary to the Smithfield ponds and Messalonskee Stream is relatively close to the main river at Norridgewock. In a similar way the Messalonskee drainage seems to have been itself diverted from its original course, so that this stream is turned northward nearly to the point of its junction with the Kennebec. Another stream whose present abnormal course suggests similar diversion is the Cobbosseecontee. The result of all these diversions has been to create valuable water powers. These drainage changes, examples of which are not peculiar to the Kennebec basin but are common throughout western Maine, might be described with greater detail had fuller study been made of this interesting subject. The statements made above are, however, sufficient to indicate to what a large degree the present wealth of available water powers in the Kennebec basin is the result of the glacial history of the region.

A hardly less important result of the glaciation has been the formation of the numerous lakes and ponds that are so characteristic of almost the whole of the Kennebec basin. As has been pointed out, the original system of drainage was so modified by the distribution of glacial deposits as hardly to be recognizable in the present stream arrangement, and with this stream adjustment is connected the origin of these ponds and lakes, the total area of whose water surface is very great, as is shown in other portions of this report. These conditions are extremely important in their economic bearing, for the ponds and lakes, together with extensive swamps, constitute a vast storage system by which the water supply is held in reserve, the rather indirect communication which many of these natural reservoirs have with the main river serving to hold back the water somewhat in times of freshets. So it is that the glacial occupation of this drainage basin is responsible not only for the creation of most of the Kennebec water powers, but also for the constancy of the flow.

The existing topography, as has been shown above, is the result of modification of an earlier topography by the different geologic processes. Although the present seems to the casual observer to be a period of equilibrium and quiet so far as these geologic processes are concerned, in reality this may not be the case, so silent and slow moving are these natural forces. It is therefore of interest to suggest the stage in topographic development which has been reached at the present time. As might be expected, different portions of the Kennebec Valley exhibit quite different characters; thus the broad valley along the lower courses of the river is in marked contrast with the canyon occupied by the stream north of Bingham. The canyon-like character of the valley of the upper Kennebec is all the more noticeable because of the type of upland topography to be seen a few miles east of the river. This upland is suggestive of a topography which is much older than that represented by the gorge through which the river runs. Thus it may be said that this part of the Kennebec basin exhibits both the mature topography of the upland and the youthful topography of the canyon. This suggests that the region had reached the stage of maturity in one cycle of its history and has now entered on the first stage in a later cycle.

The amount of relief within the Kennebec basin is considerable, although the highest mountains in the State are not included within this basin. Its highest peaks are those about the headwaters of Dead and Sandy rivers, the more prominent being Mount Bigelow, Mount Abraham, and Saddleback, and the peaks along the divide between the Kennebec and Piscataquis waters, as well as Mount Kineo. South of Moosehead Lake the upland has a general elevation between 1,000 and 1,400 feet, above which rise peaks to elevations of 2,000 to 3,000 feet. In this area the elevation of the river in the gorge is between 500 and 900 feet. Farther south the contrasts of relief are much less. The presence of the extensive elevated regions in the northern part of the basin directly affects the amount of precipitation and of forest cover within this region.

In short, in the Kennebec basin the geologic structure, the geologic processes that have controlled the evolution of the present topography, the amount of relief, and the details in the land forms all contribute to the permanence and value of the water resources described on the following pages.

DRAINAGE.

There are, according to Wells,[a] 1,084 streams in the Kennebec basin. The most important of these tributary streams are listed in the following table:[b]

Principal tributaries of Kennebec River.

- Moosehead Lake
  - Squaw Brook.
  - Roach River—Lazy Tom Brook.
  - Norcross Brook.
  - Carry Brook.
  - Williams Stream.
  - Moose Brook.
  - Socatean River.
  - Tomhegan Stream.
  - Baker Brook.
  - Moose River
    - Barrett Brook.
    - Horse Brook
      - Beaver Brook.
      - Moose Brook.
    - Wood Stream.
    - Gander Brook.
    - Henson Brook.
    - Upper Churchill Stream.
    - Lower Churchill Stream.
    - Parlin Stream.
    - Stony Brook.
    - Tom Fletcher Stream.
    - Brassua Stream.
    - Miseree Stream.

[a] Wells, Walter, The Water Power of Maine, 1869, p. 91.

[b] For descriptions of streams, ponds, and lakes in the following lists see Gazetteer at end of this paper.

- West Outlet Moosehead Lake—Churchill Stream.
- Indian Stream.
- Chase Stream.
- Cold Stream—Alder Stream.
- Moxie Stream
  - Sandy Stream.
  - Mosquito Stream.
  - Baker Stream.
- Dead River
  - North Branch
    - Bear Brook.
    - Clearwater Brook.
    - Indian Stream.
    - Cold Brook.
    - Alder Stream—Little Alder Stream.
    - Tim Brook.
  - South Branch
    - Redington Brook.
    - Black Brook.
    - Stratton Brook.
  - Reed Brook.
  - Bog Brook.
  - Spencer Stream
    - Kibby Stream.
    - Little Spencer Stream.
  - Enchanted Stream—Bitter Brook.
  - Gulf Stream.
  - Salmon Stream.
- Mink Brook.
- Bean Brook.
- Kelly Brook.
- Holway Brook.
- Pleasant Pond Stream.
- Carney Brook.
- Decker Brook.
- Whitcomb Brook.
- Houston Brook—Little Houston Brook.
- Austin Stream
  - South Branch—Ritt Brook.
  - Gulf Stream.
  - Heald Stream—Little Heald Brook.
  - Chase Stream—Bassett Brook.
  - Mink Brook.
- Jackson Brook.
- Martin Stream—Mill Stream.
- Fall Brook.
- Michael Stream.
- Carrabassett River
  - Houston Brook.
  - Poplar Brook.
  - Hammond Brook.
  - Rapid Stream.
  - Sandy Stream
    - East Brook.
    - Rowe Pond Stream.
    - West Brook.
    - Stony Brook.
    - Michael Stream.
    - Alder Stream.
  - Mill Stream—Witham Brook.

Sandy River:
- Beaver Dam Brook.
- Wilson Stream.
- Bog Stream.
- Lemon Stream.

Bombazee Brook.
Mill Stream.
Turner Brook.
Wesserunsett Stream.
Carrabassett Stream—Black Stream.
Sebasticook River—Fifteen-mile Brook.
Messalonskee Stream—Belgrade Stream.
Bond Brook.
Cobbosseecontee Stream.
Togus River.
Rolling Dam Brook.
Eastern River.
Abagadassett River.
Cathance River.
Muddy River.
Nequasset Brook.

Wells states that there are 311 lakes and ponds in the basin.[a] The largest and most important are listed below:

Principal lakes and ponds in the Kennebec basin.

CONNECTED WITH MOOSEHEAD LAKE.

Fitzgerald Pond.
Prong Pond.
Roach Ponds (3).
Trout Pond.
Spencer Pond.
Tomhegan Pond.

CONNECTED WITH MOOSE RIVER.

Indian Pond.
McKinney Pond.
Holeb Pond.
Turner Ponds (2).
Toby Ponds (3).
Attean Pond.
Moores Pond.
Wood Pond.
Little Big Wood Pond.
Benjamin Ponds (3).
Sally Pond.
Ponco Ponds (2).
Heald Pond.
Long Pond (Jackman and Long Pond townships).
Fish Pond.
Muskrat Pond.
Mud Pond.
Ironbound Pond.
Parlin Pond.
Long Pond (Parlin Pond Township).
Smith Pond.
Brassua Lake.
Luther Pond.
Miseree Pond.

[a] Op. cit., p. 93.

CONNECTED WITH DEAD RIVER.

North Branch of Dead River:
- South Boundary Pond.
- Northwest Boundary Pond.
- North Boundary Pond.
- Horseshoe Pond.
- Otter Pond.
- Round Pond.
- Natanis Pond.
- Little Pocket Pond.
- Long Pond.
- Bog Pond.
- Lower Pond.
- Viles Pond.
- Chase Pond.
- Blanchard Pond.
- Bear Pond.
- Round Mountain Lake.
- Snow Pond.
- Greenbush Pond.
- Shallow Pond.
- Jim Pond.
- Little Jim Pond.
- Tim Pond.
- Barnard Pond.
- Welhern Pond.
- Tee Pond.

South Branch of Dead River:
- Saddleback Ponds (2).
- Dead River Pond.
- Redington Ponds (3).
- Long Pond.

Spencer Stream:
- Rock Pond.
- Iron Pond.
- Baker Pond.
- Spectacle Pond.
- Long Pond.
- Bartlett Pond.
- Horseshoe Pond.
- Parker Pond.
- Spencer Ponds (3).
- Whipple Pond.
- Hall Pond.

Dead River proper:
- Flagstaff Lake.
- Butler Ponds.
- Deer Pond.
- Spring Lake.
- Carrying Place Ponds.
- Alder Pond.

CONNECTED WITH AUSTIN STREAM.

Austin Ponds.
Little Austin Pond.
Withee Pond.
Heald Ponds (3).
Chase Pond.
Chase Bog Pond.
Mink Ponds (2).

CONNECTED WITH CARRABASSETT RIVER.

Dutton Pond.
Tufts Pond.
Grindstone Pond.
Indian Pond.
Lily Pond.
Middle Carrying Place Pond.
Rowe Ponds.
Beans Pond.
Brandy Pond.
Gilman Pond.
Judkins Pond.
Butler Pond.
Embden Pond.
Hancock Pond.
Spruce Pond.
Fahi Pond.
Sandy Pond.
Mud Pond.
Boynton Pond.

CONNECTED WITH SANDY RIVER.

Sandy River Ponds (4).
Locks Pond.
Sand Pond.
Chesterville Ponds.
Norcross Pond.
Wilton Pond.
North Pond.
McGurdy Pond.
Clear Water Pond.

CONNECTED WITH WESSERUNSETT STREAM.

Weeks Pond.
Wyman Pond.
Wentworth Pond.
Savage Pond.
Hayden Lake.

CONNECTED WITH SEBASTICOOK RIVER.

Moose Pond.
Barker Pond.
Starbird Pond.
Stafford Pond.
Mill Pond.
Indian Pond.
Little Indian Pond.
Rogers Pond.
Weymouth Pond.
Palmyra Ponds (2).
Whites Pond.
Sebasticook Lake.
Hicks Pond.
Nokomis Pond.
Corinna Ponds (2).
Dexter Pond.
Stetson Pond.
Plymouth Ponds (2).
Skinner Pond.
Unity (Twenty-five Mile) Pond.
Sandy Pond.
Lovejoy Pond.
Pattee Pond.
China Lake.

CONNECTED WITH MESSALONSKEE STREAM.

Messalonskee Lake.
Ward Pond.
Moose Pond.
Long Pond.
Beaver Pond.
Kidder Pond.
Great Pond.
Ellis Pond.
McGrath Pond.
North Pond.
Little Pond.
East Pond.

CONNECTED WITH COBBOSSEECONTEE STREAM.

Pleasant Pond.
Loon Pond.
Horseshoe Pond.
Purgatory Pond.
Sand Pond.
Buker Pond.
Jimmy Pond.
Sanborn Pond.
Jamies Pond.
Cobbosseecontee Pond.
Richard Pond.
Shed Pond.
Lake Annabessacook.
Wilsons Pond.
Cochnewagon Pond.
Dexter Pond.
Berry Pond.
Narrows Pond.
Carlton Pond.
Lake Maranacook.
Greeley Pond.

CONNECTED WITH KENNEBEC RIVER.

Moosehead Lake.
West Outlet Ponds (3).
Indian Pond.
Burnham Pond.
Big Indian Pond.
Little Indian Pond.
Ten Thousand Acre Ponds.
Island Pond.
Ellis Pond.
Dead River Pond.
Long Pond (T. 1, R. 6).
Wilsons Pond.
Knights Pond.
Black Brook Pond.
Fish Pond.
Cold Stream Pond.
Moxie Pond.
Mosquito Pond.
Baker Pond.
Mountain Pond.
Dimmick Ponds (2).
Pierce Pond.
Otter Ponds (2).
Pleasant Pond.
Robinson Pond.
Doughnut Pond.
Carrying Place Pond.
Decker Ponds.

Youngs Pond.
Emerton Ponds.
Turner Pond.
Mill Pond.
Merrill Pond.
Jackson Pond.
Sebleys Pond.
Long Pond (Hartland Township).
Lake George.
Oak Pond.
Weber Pond.
Threemile Pond.
Spectacle Pond.
Dam Pond.
Tolman Pond.
Togus Pond.
Threecornered Pond.
Greeley Pond.
Nehumkeag Pond.
Bradley Pond.
Nequasset Pond.

The following table, compiled from the Tenth Census, vol. 16, from publications of the United States Geological Survey, and from the best maps obtainable, shows the drainage area at different points on the Kennebec River and its tributaries:

Drainage areas of Kennebec River and its tributaries.

Stream.	Point of measurement.	Drainage area.
		Sq. miles.
Kennebec River	Outlet Moosehead Lake	1,240
Do	The Forks gaging station above mouth of Dead River	1,570
Do	Below and including Dead River	2,440
Do	Solon dam	2,700
Do	North Anson gaging station above mouth of Carrabassett River.	2,790
Do	Below and including Carrabassett River	3,180
Do	Madison dam	3,200
Do	Above mouth of Sandy River	3,220
Do	Below and including Sandy River	3,890
Do	Skowhegan dam	3,950
Do	Somerset Mills, Fairfield	4,260
Do	Waterville, Hollingsworth & Whitney Co.'s dam above mouth of Sebasticook River.	4,270
Do	Below and including Sebasticook River	5,240
Do	Above mouth of Messalonskee Stream	5,240
Do	Below and including Messalonskee Stream	5,450
Do	Augusta	5,580
Do	Above mouth of Cobbosseecontee Stream	5,600
Do	Below and including Cobbosseecontee Stream	5,840
Do	Head of Merrymeeting Bay	5,970
Moose River	Outlet of Holeb Pond	170
Do	Outlet of Attean Pond	270
Do	Outlet of Wood Pond	320
Do	Outlet of Long Pond	520
Do	Outlet of Brassua Lake	675
Do	Gaging station at mouth	680
Roach River	Outlet of Upper Roach Pond	20
Do	Outlet of Middle Roach Pond	35
Do	Gaging station near Roach River at outlet of Lower Roach Pond.	85
Do	Mouth	120
Moxie Stream	Outlet of Moxie Pond	80
Do	Mouth	90
North Branch of Dead River.	Above junction with South Branch	200
South Branch of Dead River.	Above junction with North Branch	380
Dead River	Above mouth of Spencer Stream	570
Do	Below and including Spencer Stream	760
Do	Gaging station at mouth	870
Carrabassett River	Above mouth of Rapid Stream	90
Do	Below and including Rapid Stream	160
Do	Gaging station at North Anson	340
Do	Mouth	395
Sandy River	Phillips	160
Do	Farmington Falls above Wilson Stream	370
Do	Below and including Wilson Stream	490
Do	Gaging station near Madison	650
Do	Mouth	670
Sebasticook River	Outlet Moose Pond	220
Do	Near Pittsfield above East Branch	320
Do	Below and including East Branch	560
Do	Mouth	970
Messalonskee Stream	Gaging station at Waterville	205
Do	Mouth	210
Cobbosseecontee Stream	Gaging station at mouth	240

FOREST CONDITIONS.[a]

The upper portion of the Kennebec River drainage basin is heavily timbered, although extensive cutting has been going on for many years. Spruce is the most abundant, but large quantities of poplar, valuable in the production of the best grades of paper, are found. There are approximately 2,350 square miles of timber land in the basin, and about 3,883,000,000 feet of spruce standing (1902) suitable for lumber and pulp. About one-third of all the lumber used in the State for pulp and paper comes from the Kennebec basin, the remainder being almost wholly supplied by the forests of the Androscoggin and Penobscot basins.

POPULATION AND INDUSTRIES.

The population of the northern half of the basin is in general concentrated in lumber camps and a few small towns, which exist for the purpose of distributing men and supplies for lumbering, but there is a sparse farming population that caters to the needs of the lumbermen. In addition a considerable number of sportsmen live within the basin during the season for fishing and hunting. The lower half of the basin is very generally in farming lands, but several towns are engaged in the collection of produce and distribution of supplies and in manufacturing. Notable among the manufacturing towns are Solon, Madison, Skowhegan, Waterville, Augusta, and Gardiner. The principal products are pulp, paper, lumber, and cotton and woolen goods.

The following table gives the population of some of the principal towns and cities, based on the census of 1900:

Population of principal cities and towns in Kennebec basin.

Augusta	11, 683	Farmington	3, 288
Gardiner	5, 501	Pittsfield	2, 891
Hallowell	2, 714	Newport	1, 533
Waterville	9, 477	Norridgewock	1, 495
Fairfield	2, 238	Winslow	2, 227
Skowhegan	4, 266	Richmond	2, 049
Madison	2, 764	Winthrop	2, 088
Solon	996	Oakland	1, 913
Greenville	1, 117		

The river is one of the best streams in the United States for the development of water power, and the upper section is used largely for log driving. The river is open during eight months of the year and is navigable as far as Augusta to vessels drawing 10 feet. Several cities and towns obtain their water supplies from the river. The ice-cutting industry is also of considerable importance. From the

[a] Fourth Rept. Forest Commissioner of Maine, 1902.

20-mile stretch between Augusta and Richmond, all within the navigable portion, many thousands of tons of ice are cut yearly and shipped for use in southern cities.

TRANSPORTATION FACILITIES.

Water transportation is available below Augusta. Rail transportation is provided by the Maine Central Railroad to points along the river south of Skowhegan; by the Somerset Railway, through its connection with the Maine Central at Oakland, to the middle and northern parts of the basin as far north as Bingham; and by the Canadian Pacific and Bangor and Aroostook railways, through their numerous connections with the Maine Central, to the northern part of the basin. An extension of the Somerset Railway, now being constructed, will when completed extend to Birch Point, on the shore of Moosehead Lake, opposite Kineo, forming a junction with the Canadian Pacific Railway near the west outlet of Moosehead Lake.

PRECIPITATION.

Precipitation stations have been maintained at the following places in the Kennebec River drainage area and its immediate vicinity. With the exception of those at Chesuncook, Grant Farm, and The Forks, which were established by the United States Geological Survey, these stations have been maintained by the United States Weather Bureau.

Rainfall stations in Kennebec basin.

	Approximate elevation above sea level (feet).		Approximate elevation above sea level (feet).
Chesuncook	950	Kents Hill	300
Fairfield	90	Kineo	1,050
Farmington	368	Madison	250
Flagstaff	1,400	Mayfield	1,300
Gardiner	100	Roach River	1,150
Grant Farm	1,000	Solon	350
Greenville	1,040	The Forks	590
Jackman	1,220	Winslow	80

In the northern and more remote parts of the basin considerable difficulty has been experienced in obtaining continuous records. The station at Gardiner (fig. 2), however, furnishes an unbroken record for more than fifty years (from 1839 to 1889).

In computing the mean monthly and yearly precipitation, where data are lacking for a few months only, they have been supplied from adjacent stations, as noted. It appears that the mean annual rainfall for selected stations is as follows:

Mean annual precipitation, in inches, in Kennebec basin.

Station.	Period of record.	For period.	1899–1905, inclusive.	1902–1905, inclusive.
Fairfield	1891–1905	34.46	36.82	35.39
Farmington	1891–1905	42.90	43.00	39.45
Flagstaff	1896–1901	38.48	....	....
Gardiner	1839–1888	44.73	42.59	40.16
Kineo	{1895–1897 / 1901–1902}	35.72	....	....
Mayfield	1899–1905	43.31	43.31	42.63
The Forks	1902–1905	37.90	....	....
Winslow	1896–1905	38.87	39.31	37.29
Average	....	39.55	41.01	38.98

The third column of the foregoing table gives a good idea of the amount of and variation in annual precipitation, although the stations are, of course, not very evenly placed and should not be weighted alike. Apparently the precipitation in the Kennebec basin

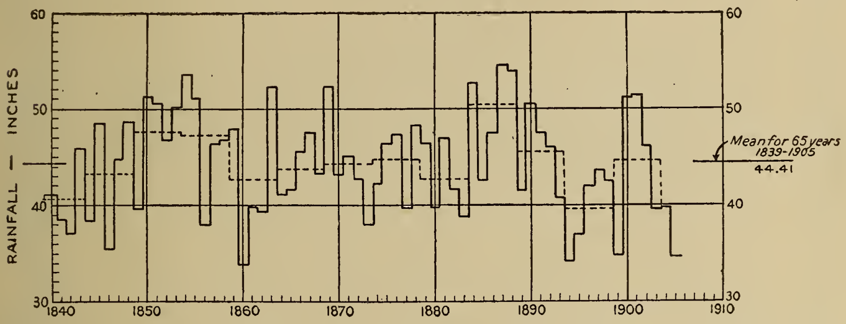


FIG. 2.—Mean annual precipitation at Gardiner, Me., 1839–1905. Records from 1890 to 1892 are mostly from Lewiston. Dotted lines show means for five-year intervals.

reaches a maximum of about 45 inches near the coast, as shown by the Gardiner records. There is a slight falling off farther inland, in the vicinity of Winslow and Fairfield, and then an increase (see Farmington and Mayfield records) to almost the same amount as near the coast. Probably there is a gradual decrease from these points northward, a minimum of between 30 and 35 inches being reached in the extreme northern part of the basin. The mean annual precipitation over the whole basin above Gardiner is about 39 to 40 inches.

Monthly and annual precipitation in Kennebec basin.

CHESUNCOOK.[a]

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1904	1.78	0.80	2.11	2.52	3.49	2.75	4.23	5.44	5.44	1.70	0.91	0.59	31.76
1905	2.67	.69	1.32	.71	2.42	1.65	1.52	.92	1.18	.77	3.15	2.22	19.22
1906	1.94	1.61	4.22	2.33	2.74	3.10	......	......	......	......	......	......	....

[a] In basin of Penobscot River.

Monthly and annual precipitation in Kennebec basin—Continued.

FAIRFIELD.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1891	6.12	2.23	4.75	1.97	2.26	2.03	4.63	4.00	2.06	1.38	2.14	4.56	38.13
1892	3.38	2.28	1.82	.80	2.67	5.79	1.78	5.58	3.23	1.37	3.17	1.10	32.97
1893	1.62	2.77	2.49	2.13	3.42	.99	2.27	2.90	2.12	4.89	.86	2.36	28.82
1894	2.43	1.03	.86	.72	3.78	2.97	2.56	3.50	3.82	2.41	2.02	1.82	27.92
1895	2.23	.34	1.58	3.50	1.83	1.96	3.08	2.59	1.11	1.58	5.47	3.77	29.04
1896	.31	2.95	5.62	1.28	2.33	1.91	3.21	3.83	5.10	2.00	2.35	1.17	32.06
1897	3.31	1.00	2.63	2.40	4.47	3.39	3.52	2.82	2.54	.53	3.98	3.06	33.65
1898	5.07	6.48	1.45	2.31	1.55	3.32	1.13	3.71	2.37	4.33	3.71	1.42	36.85
1899	2.76	2.73	3.66	1.05	2.05	1.39	5.13	.46	3.58	1.11	2.32	1.93	28.17
1900	5.89	7.00	4.75	1.63	5.18	4.08	3.40	1.76	2.55	4.05	4.55	2.19	47.03
1901	2.74	1.95	5.22	3.96	2.35	1.64	2.99	3.39	3.79	2.77	2.19	7.98	40.97
1902	2.25	1.54	7.76	2.41	2.54	4.04	2.22	4.06	1.86	4.01	1.03	4.68	38.40
1903	3.94	3.39	6.35	1.95	.37	3.56	[a]4.53	[a]3.37	[a]1.01	[a]3.31	1.06	2.70	35.54
1904	3.21	1.65	3.78	5.75	4.75	2.32	2.69	4.39	5.58	2.05	1.61	1.44	39.22
1905	3.78	.99	.88	2.15	2.22	3.49	3.65	1.43	2.45	.38	3.80	3.19	28.41
1906	2.59	2.52	[a]3.33	3.09	3.55	3.29	......	......	......	......	......	......	....
Mean, 1891-1905.	3.27	2.55	3.57	2.27	2.78	2.86	3.12	3.19	2.87	2.41	2.68	2.89	34.46

FARMINGTON.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1891	6.54	2.13	8.28	1.97	1.94	3.93	3.42	4.03	1.45	1.68	2.69	5.64	43.70
1892	5.45	2.33	2.33	.85	3.75	6.26	3.29	5.09	4.16	1.49	4.44	1.39	40.83
1893	2.66	3.81	2.69	2.34	6.95	2.78	1.60	3.76	3.02	5.72	2.99	3.39	41.71
1894	1.64	2.22	2.20	1.43	5.14	3.20	1.92	2.61	5.73	5.02	2.97	2.76	36.84
1895	4.05	.95	1.88	5.67	3.06	3.38	1.05	5.93	1.92	1.99	5.76	6.25	41.87
1896	.80	5.58	10.83	2.66	[b]2.80	2.49	3.75	3.97	4.62	3.88	4.22	1.15	46.75
1897	5.45	[b]2.13	4.85	3.19	3.75	4.32	8.11	3.93	2.98	.95	5.01	4.98	49.65
1898	[b]5.54	6.85	.55	2.71	1.79	4.34	2.80	3.27	2.82	4.63	4.40	1.44	41.14
1899	2.57	2.60	5.79	.92	1.97	2.41	5.07	1.91	3.26	1.43	2.60	2.71	33.24
1900	6.19	10.76	7.04	1.74	5.12	5.51	4.88	2.30	4.82	4.23	8.50	1.77	62.80
1901	3.27	1.04	4.54	6.88	3.95	3.47	4.22	3.45	2.25	3.03	2.10	8.97	47.17
1902	3.06	2.32	8.43	3.67	5.16	5.28	1.93	3.34	3.60	4.68	1.19	4.31	46.97
1903	3.61	2.81	5.67	2.47	.59	5.70	4.27	2.67	1.17	3.08	1.24	4.19	37.47
1904	3.52	.72	3.13	6.36	5.72	1.03	4.97	4.58	4.44	2.09	1.83	1.76	40.15
1905	3.79	.70	1.41	2.12	2.65	3.60	4.07	3.10	5.27	1.24	2.58	2.69	33.22
1906	2.29	1.89	4.30	2.06	3.67	5.41	......	......	......	......	......	......	....
Mean, 1891-1905.	3.86	3.13	4.64	3.00	3.62	3.85	3.69	3.60	3.43	3.01	3.50	3.58	42.90

FLAGSTAFF.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1895	......	......	......	......	......	......	......	3.54	1.49	1.06	4.18	3.62	....
1896	1.20	3.92	6.97	1.45	2.75	2.40	4.85	3.14	4.53	3.44	2.80	1.05	38.50
1897	2.90	2.60	3.07	3.02	7.33	4.27	7.77	5.01	3.72	.72	[a]4.96	2.53	47.90
1898	4.80	6.90	[a]1.05	1.76	1.20	2.45	1.05	3.60	3.21	2.65	3.25	1.05	32.97
1899	1.85	3.83	4.05	.67	1.95	1.19	[a]6.81	.33	1.73	1.65	2.35	2.15	28.56
1900	4.30	5.40	3.90	.35	3.55	3.43	4.80	2.17	2.35	2.47	5.66	2.45	40.83
1901	2.20	1.50	2.75	7.83	2.34	4.58	5.01	4.95	1.65	2.40	2.20	4.88	42.29
Mean, 1896-1901.	2.88	4.02	3.63	2.51	3.19	3.05	5.05	3.20	2.86	2.22	3.52	2.35	38.48

GARDINER.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1839	2.45	2.10	2.66	3.87	5.04	4.45	5.26	5.21	2.27	0.41	4.22	3.10	41.04
1840	1.77	2.29	4.14	4.14	4.22	4.20	1.72	3.72	1.54	6.02	3.88	3.52	41.16
1841	5.72	1.12	3.24	5.29	3.58	3.17	1.58	1.08	3.83	1.46	3.37	5.09	38.53
1842	2.88	4.49	3.26	2.51	1.83	3.05	3.08	2.35	3.06	1.61	3.33	5.67	37.12
1843	2.54	5.67	5.50	5.52	3.50	3.96	1.76	4.80	1.17	5.28	3.58	2.71	45.99
1844	3.95	1.68	4.82	.65	3.01	1.79	1.47	3.03	2.36	5.72	3.93	5.91	38.32
1845	5.85	2.25	2.96	2.59	2.68	1.95	6.55	2.40	3.20	2.89	10.56	4.82	48.70
1846	2.66	1.29	6.27	1.59	4.83	2.77	2.62	3.83	1.00	2.09	3.42	2.95	35.32
1847	5.11	3.67	1.62	2.90	2.69	6.32	3.34	3.95	3.32	4.06	3.64	4.28	44.90
1848	3.84	2.53	2.84	1.22	8.64	1.88	6.29	4.32	5.76	4.59	2.38	4.56	48.85
Mean, 1839-1848.	3.68	2.71	3.73	3.03	4.00	3.35	3.37	3.47	2.75	3.41	4.23	4.26	41.99

[a] No record; figures supplied from Winslow record.
[b] No record; figures supplied from Gardiner record.

Monthly and annual precipitation in Kennebec basin—Continued.

GARDINER—Continued.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1849	0.92	1.50	2.80	3.47	5.18	2.59	1.69	6.11	2.81	5.85	2.67	3.97	39.56
1850	3.09	2.96	2.29	2.98	11.76	5.44	3.04	4.31	3.70	5.29	2.41	4.10	51.37
1851	4.66	4.45	1.88	3.74	3.16	3.42	5.56	2.36	2.76	8.43	6.30	4.05	50.77
1852	2.36	3.89	2.22	6.13	.36	3.89	2.80	5.87	3.51	4.38	6.33	4.92	46.66
1853	1.49	9.47	1.94	1.14	7.16	.95	4.10	3.34	5.17	4.45	6.47	4.46	50.14
1854	2.78	4.35	4.73	5.62	5.28	5.05	4.95	1.41	5.03	3.25	8.12	3.16	53.73
1855	7.17	1.80	1.10	4.57	1.93	5.98	2.42	3.09	1.76	13.15	3.18	5.01	51.16
1856	2.25	1.95	.90	2.46	4.52	2.06	2.49	7.49	3.82	3.20	2.14	4.70	37.98
1857	4.22	2.46	4.03	5.30	4.74	3.59	2.33	5.51	1.24	4.97	3.63	4.19	46.22
1858	3.11	2.33	3.16	4.44	3.02	2.51	6.43	7.26	3.74	5.06	2.91	2.87	46.84
Mean, 1849–1858.	3.20	3.52	2.50	3.98	4.71	3.55	3.58	4.68	3.35	5.80	4.42	4.14	47.43
1859	4.42	2.15	10.06	2.51	3.00	6.35	1.77	2.79	2.48	1.08	4.75	6.54	47.90
1860	1.04	3.30	2.14	1.32	.87	2.36	1.97	4.70	3.63	3.81	5.36	3.26	33.76
1861	2.94	3.26	5.47	4.35	4.40	1.27	4.14	1.37	1.85	5.47	3.16	2.17	39.85
1862	4.20	3.60	3.49	2.75	1.92	3.81	2.41	1.94	3.18	5.21	4.33	2.56	39.40
1863	4.42	3.75	4.23	3.98	2.56	1.73	6.46	4.39	4.34	4.74	7.30	4.35	52.26
1864	3.51	2.07	4.58	2.46	3.94	.90	.59	6.12	4.32	2.76	5.77	4.03	41.05
1865	3.10	2.85	5.39	4.43	5.05	2.68	4.61	1.46	.84	4.75	3.24	3.23	41.63
1866	1.63	5.24	5.47	1.91	4.97	3.50	3.01	5.50	5.66	2.59	3.18	3.00	45.66
1867	2.62	4.36	5.76	4.96	5.27	1.96	3.94	8.49	.98	4.60	2.85	1.89	47.68
1868	2.86	1.87	2.38	2.28	9.59	3.20	1.87	1.06	8.24	.98	6.76	2.04	43.13
Mean, 1859–1868.	3.07	3.24	4.90	3.10	4.16	2.78	3.08	3.78	3.55	3.60	4.67	3.31	43.24
1869	1.96	6.75	4.00	3.05	4.50	5.50	1.51	1.17	3.37	12.67	3.10	4.74	52.32
1870	6.12	5.93	3.22	4.78	1.90	1.94	2.43	1.99	1.33	6.39	4.19	2.82	43.04
1871	2.11	1.56	5.37	3.38	3.92	1.58	4.58	4.93	1.84	7.58	4.90	3.28	45.03
1872	1.86	1.84	3.03	1.85	2.58	3.88	3.10	6.98	4.73	3.42	5.82	3.57	42.64
1873	4.63	2.09	3.94	2.97	2.38	1.26	3.56	1.59	3.88	6.01	3.63	2.03	37.97
1874	4.39	3.33	1.96	4.63	3.14	3.86	5.57	6.21	2.76	1.72	2.99	1.54	42.10
1875	2.94	3.72	3.70	3.92	2.90	5.87	2.22	6.66	4.89	5.06	3.67	.83	46.35
1876	3.03	5.88	7.96	2.69	3.62	2.95	6.16	.20	4.63	2.59	4.13	3.45	47.29
1877	1.69	.55	7.91	3.01	1.61	1.16	2.22	5.28	1.42	5.27	8.24	1.24	39.60
1878	3.57	2.73	3.13	5.84	1.49	3.69	1.08	4.43	2.39	7.82	4.60	7.55	48.32
Mean, 1869–1878.	3.23	3.44	4.42	3.61	2.80	3.17	3.24	3.94	3.12	5.85	4.53	3.10	44.45
1879	2.88	3.08	4.21	3.39	1.50	5.83	5.27	5.21	4.05	2.05	4.70	4.19	46.37
1880	4.10	3.61	2.68	3.29	2.39	1.53	3.94	2.18	4.06	4.39	4.86	2.96	39.99
1881	3.73	5.84	5.31	1.56	5.89	3.09	3.76	2.36	3.00	2.65	3.26	6.56	47.02
1882	3.56	4.96	5.04	2.65	4.74	4.25	2.60	.34	7.00	2.02	1.14	3.53	41.83
1883	2.50	2.89	2.24	3.46	5.02	4.86	3.49	.32	3.11	4.48	2.84	3.67	38.88
1884	5.40	7.29	5.40	6.53	4.00	1.22	5.17	4.22	2.11	3.14	3.29	5.05	52.82
1885	5.26	6.44	2.18	2.50	3.41	6.50	1.73	3.21	1.98	3.94	2.86	2.60	42.61
1886	6.61	7.25	3.90	1.43	3.76	1.85	1.93	2.82	3.68	3.67	6.06	4.68	47.64
1887	7.32	5.62	7.27	6.81	1.08	3.42	6.96	3.42	1.05	2.44	3.64	5.61	54.65
1888	5.13	5.90	5.09	2.27	2.48	2.59	2.20	4.33	7.12	6.71	5.98	4.20	54.00
Mean 1879–1888	4.65	5.29	4.33	3.39	3.43	3.51	3.70	2.84	3.72	3.55	3.86	4.30	46.57
Mean 1839–1888	3.57	3.64	3.98	3.42	3.82	3.27	3.39	3.74	3.30	4.44	4.34	3.82	44.73
1889	5.20	1.84	2.76	2.38	2.54	4.18	2.96	1.60	2.56	4.59	5.44	5.51	41.56
1890	3.18	3.78	4.52	1.51	7.84	3.61	(a)	......	......	......	......	......	....
1893	2.70	4.79	3.18	2.52	4.66	2.56	1.12	3.27	3.23	5.90	1.83	5.13	40.89
1894	3.30	1.99	1.44	1.86	5.84	1.18	2.30	3.08	3.81	4.25	2.21	2.80	34.06
1895	2.50	1.64	2.48	4.83	1.50	2.01	4.55	3.28	1.21	1.82	6.85	4.40	37.07
1896	.87	5.25	7.19	2.02	2.80	1.94	3.18	2.88	7.60	2.64	4.12	1.52	42.01
1897	4.51	2.13	4.30	2.86	5.94	4.32	3.15	2.66	3.11	.92	5.99	3.83	43.72
1898	5.54	5.45	1.76	3.44	1.60	3.56	.98	3.73	2.90	6.23	4.57	2.74	42.50
1899	3.41	3.10	5.56	1.19	1.87	2.43	5.48	1.08	3.90	1.85	2.42	2.61	34.90
1900	7.19	8.96	7.23	2.50	5.42	1.34	1.87	2.77	2.45	4.47	5.28	1.64	51.12
1901	3.78	1.76	6.25	6.43	3.97	1.36	4.26	5.54	2.08	4.18	2.41	9.43	51.45
1902	2.67	1.70	10.33	3.71	2.01	4.52	2.07	4.46	3.22	4.90	1.21	5.35	46.15
1903	4.54	3.63	6.65	1.42	.45	5.12	4.77	2.90	1.34	3.82	1.63	3.56	39.83
1904	4.12	2.24	3.71	7.10	3.95	1.29	1.25	4.53	5.09	2.02	2.39	2.28	39.97
1905	4.85	1.32	.94	2.10	2.17	4.83	4.52	2.03	4.09	.78	3.95	3.12	34.70
1906	2.95	1.98	4.80	3.74	4.52	4.89	......	......	......	......	......	......	....
Mean, 1893–1905	3.84	3.38	4.69	3.23	3.24	2.80	3.04	3.25	3.39	3.37	3.45	3.72	41.40
Mean 1839–1903 [b]	......	......	......	......	......	......	......	......	......	......	......	......	44.41

[a] No record at Gardiner from July, 1890, to December, 1892, inclusive.
[b] Missing records, 1890–1892, supplied from Lewiston records.

Monthly and annual precipitation in Kennebec basin—Continued.

GRANT FARM.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1904		0.38	1.70	1.30	4.01	2.91	3.96	2.55	7.85	2.72	1.31		
1905					4.05	2.66	2.70	.79	1.15	.48	1.62		

GREENVILLE.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1904					5.27	3.60	6.85	4.09	7.63	2.44	0.47		
1905				1.91	3.22	3.99	2.52	1.43	2.82	.86	2.51	1.22	
1906	1.20	1.23		2.20	4.72	3.43	6.28						

JACKMAN.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1894	2.25	1.48	1.79										
1897		2.20	2.55	0.95	5.00	4.00	6.23	2.45	4.20	1.68			
1903	2.32	4.65	3.30	1.51									
1904				1.91							1.52	1.82	
1905	2.42	.94	1.28	.84							1.91	2.10	
1906	1.57	1.57	3.15	1.85	4.33	3.72							

KENTS HILL.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1891	6.28	3.41	5.37	1.85	1.98	3.05	4.50	4.00	1.50	2.12	1.79	5.57	41.42
1892	4.88	1.60	1.79	1.05	2.79	5.75	2.48	6.30	4.98	1.25	3.98	1.37	38.22
1893	2.41	4.53	2.95	2.85	6.76								
1894		1.32											

KINEO.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1895	2.11	1.35	1.22	2.03	2.58	3.26	4.07	4.90	1.45	0.87	5.47	2.99	32.30
1896	.37	2.51	4.49	2.24	2.46	2.47	4.02	2.00	3.27	3.61	1.95	.90	30.29
1897	2.82	1.95	2.43	3.27	3.96	2.59	8.37	3.11	2.62	1.52	2.69	2.25	37.58
1898	4.24	6.90	.82	2.22			.90	3.30	4.50				
1899		3.50			3.20	3.94	7.37						
1900	5.17	3.47	3.90		3.49	3.24	5.21	1.51	2.55				
1901	2.65	1.80	1.45	4.85	.75	6.55	1.95	2.55	.94	2.26	2.70	7.40	35.85
1902	2.15	3.60	4.73	2.65	4.67	6.15	4.03	3.01	5.46	a3.40	.81	2.01	42.67
1903	2.36		4.99		2.79							2.01	
1904				1.54	2.71								
Mean, 1895–1897 1901–2	2.02	2.24	2.86	3.01	2.88	4.20	4.49	3.11	2.75	2.33	2.72	3.11	35.72

MADISON.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1894	3.23	2.25	1.70	1.45	4.75	6.00	2.12	3.28	4.81	5.30			
1902	3.91	3.88	11.04	3.62	5.49	7.45	2.29	5.93	3.70	6.61	1.42	4.63	59.97
1903	4.34	3.98	6.32	1.94	.23	3.72	5.37	2.30	.76	2.40	1.17	1.43	33.96
1904	2.28	1.71	2.79	7.63	6.63	3.36	6.10	7.38	6.34	2.98	1.23	1.55	49.98
1905	4.08	1.61	2.13	2.59	3.73	4.65	5.75	2.23	5.61	1.13	4.60	3.45	41.56
1906	4.04	2.99	4.83	4.27	5.12	5.72							
Mean, 1902–1905	3.65	2.80	5.57	3.94	4.02	4.80	4.88	4.46	4.10	3.28	2.10	2.76	46.36

a No record; figures supplied from The Forks record.

Monthly and annual precipitation in Kennebec basin—Continued.

MAYFIELD.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1891	......	......	......	3.75	2.37	3.34	5.11	4.78	1.58	1.56	2.91	......	....
1892	......	......	......	......	......	8.36	2.73	9.19	5.63	1.60	5.14	......	....
1893	......	......	......	1.86	5.65	2.69	3.27	5.20	4.21	7.37	3.49	......	....
1894	......	......	......	1.17	4.83	6.45	2.65	2.05	5.71	6.41	2.48	......	....
1895	......	......	......	6.21	3.83	3.03	4.44	3.86	2.09	2.25	7.63	5.84	....
1896	0.94	......	......	2.34	3.02	3.13	6.07	4.90	5.31	4.77	5.11	1.24	....
1897	......	......	......	4.56	5.04	3.41	8.04	4.07	3.01	1.43	5.12	3.43	....
1898	......	......	......	2.26	1.88	2.94	1.52	4.43	3.57	5.79	6.02	1.14	....
1899	2.50	4.00	4.87	.99	3.02	2.04	4.79	1.05	3.33	1.71	2.19	3.05	33.54
1900	6.27	7.39	5.65	1.57	5.84	3.31	4.48	1.25	3.26	2.99	7.43	1.10	50.54
1901	2.60	1.20	5.55	6.33	2.26	2.94	5.40	5.25	2.63	3.43	2.24	8.63	48.46
1902	3.21	3.60	9.50	4.16	3.40	7.39	2.95	6.36	4.33	5.83	1.65	4.12	56.50
1903	5.48	3.27	5.33	1.56	.58	6.54	5.27	3.03	.85	3.12	1.61	3.06	39.70
1904	3.07	1.81	2.76	3.42	6.86	3.17	4.41	5.32	5.73	2.42	1.58	1.47	42.02
1905	4.25	[a]1.11	1.00	2.17	3.29	3.39	4.39	1.86	4.40	.90	2.87	2.69	32.32
1906	2.69	2.01	5.24	2.70	3.90	4.61	......	......	......	......	......	......	....
Mean, 1899–1905	3.91	3.20	4.95	2.89	3.61	4.11	4.53	3.45	3.50	2.91	2.80	3.45	43.31

ROACH RIVER.

1901	......	......	......	......	......	......	......	......	......	......	2.95	6.95	....
1902	3.25	3.82	3.37	1.21	3.56	9.29	4.30	5.32	......	3.21	1.16	2.70	....
1903	2.05	4.90	5.76	2.23	......	......	......	......	......	......	......	......	....

SOLON.

1902	......	......	......	3.20	4.62	......	2.92	3.43	5.39	3.43	2.30	3.10	....
1903	3.78	2.81	4.90	......	......	......	......	......	......	......	......	......	....

THE FORKS.

1901	......	......	......	......	......	......	......	......	......	3.31	2.60	8.80	....
1902	3.50	3.35	5.69	3.20	4.62	6.42	2.92	3.43	5.39	3.40	2.30	3.10	47.32
1903	2.30	3.63	4.42	1.35	.61	4.36	4.58	3.24	.91	1.60	1.73	2.97	31.70
1904	2.95	1.40	1.95	3.70	5.08	4.64	7.53	2.69	6.82	2.23	1.34	1.58	41.91
1905	3.39	1.11	1.30	1.68	3.58	4.33	3.37	1.86	3.47	1.24	2.90	2.40	30.63
1906	2.24	2.05	4.20	2.18	3.13	3.07	......	......	......	......	......	......	....
Mean, 1902–1905	3.04	2.37	3.34	2.48	3.47	4.94	4.60	2.81	4.15	2.12	2.07	2.51	37.90

WINSLOW.

1895	......	......	......	......	......	......	......	......	1.56	2.04	6.52	......	....
1896	0.40	3.40	6.24	1.74	2.52	2.33	3.46	3.59	5.86	2.66	2.89	1.29	36.38
1897	[b]4.51	1.39	3.06	2.44	5.30	3.34	5.50	3.42	3.02	.68	4.96	2.71	40.33
1898	4.67	4.91	1.05	2.44	1.51	3.42	1.95	3.09	2.77	5.38	3.86	1.59	36.64
1899	2.88	2.45	4.10	1.00	2.32	1.13	6.81	.25	4.03	1.34	1.76	1.90	29.97
1900	6.35	6.27	5.21	1.95	6.32	4.09	4.17	2.55	3.26	4.86	5.00	[b]1.64	51.67
1901	2.91	.65	5.15	4.50	[b]3.97	2.51	3.31	4.54	3.92	3.28	1.38	8.23	44.35
1902	2.31	1.49	8.90	2.51	2.24	4.61	2.62	[b]4.46	2.29	5.54	1.17	4.25	42.39
1903	4.14	3.01	7.15	2.21	.31	4.47	4.53	3.37	1.01	3.31	1.34	2.98	37.83
1904	2.58	1.51	3.41	5.38	4.91	1.47	2.52	4.94	5.84	2.64	1.62	1.65	38.47
1905	3.66	.93	.83	2.20	2.53	3.39	4.26	2.03	3.20	.62	4.00	2.82	30.47
1906	2.78	1.33	3.33	2.78	1.64	3.28	......	......	......	......	......	......	....
Mean, 1896–1905	3.44	2.60	4.51	2.64	3.19	3.08	3.91	3.22	3.54	3.03	2.80	2.91	38.87

[a] No record; figures supplied from The Forks record.
[b] No record; figures supplied from Gardiner record.

The table of average precipitation and fig. 3 have been prepared from the foregoing data, for the purpose of computing the ratio of run-off to rainfall at Waterville. They represent fairly well the average precipitation on the basin above Waterville after and including 1895. Probably the figures for the years previous to 1895 are slightly too great, as in those years no stations were maintained in the northern part of the basin, where the precipitation is considerably less than it is farther south. The values given in the table are based on the following records: Fairfield, 1891–1906; Farmington, 1891–1906; Kineo, 1895–1898, 1900–1902; Madison, 1894, 1902–1906; Mayfield, 1891–1906; The Forks, 1903–1906.

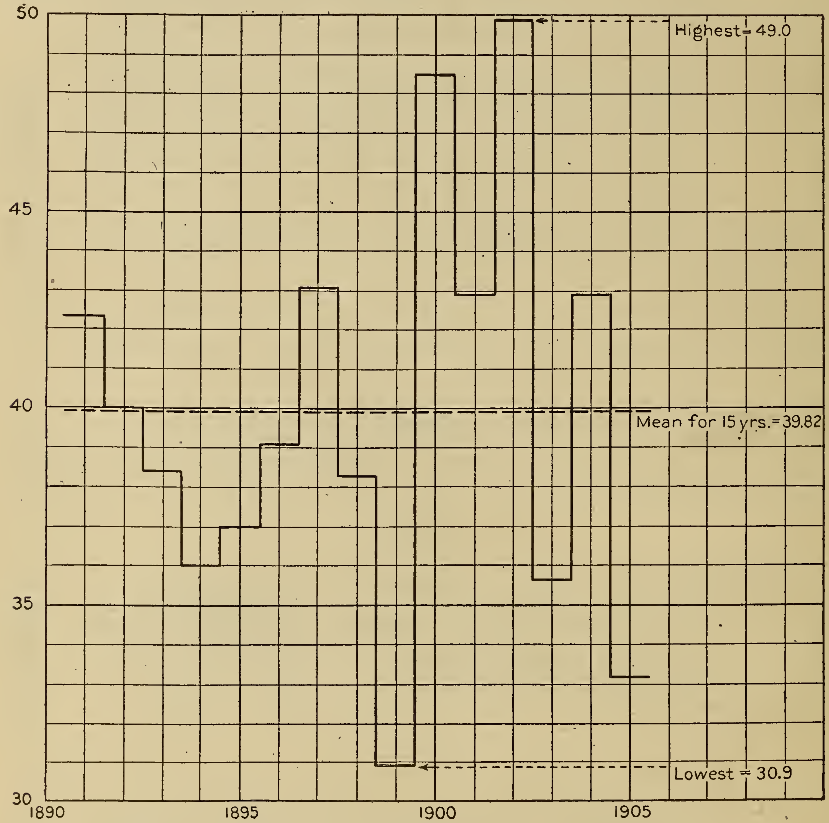


FIG. 3.—Mean annual precipitation on Kennebec basin above Waterville, Me., 1891-1905.

Average precipitation in Kennebec drainage basin above Waterville, 1891–1906.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1891	6.3	2.1	6.5	2.6	2.2	3.1	4.4	4.3	1.7	1.5	2.6	5.1	42.4
1892	4.4	2.3	2.1	0.8	3.2	6.8	2.6	6.6	4.3	1.5	4.2	1.2	40.0
1893	2.1	3.3	2.6	2.1	5.3	2.2	2.4	4.0	3.1	6.0	2.4	2.9	38.4
1894	2.4	1.8	1.6	1.2	4.6	4.6	2.3	2.9	5.0	4.8	2.5	2.3	36.0
1895	2.8	.9	1.6	4.4	2.8	2.9	3.2	4.3	1.6	1.7	6.1	4.7	37.0
1896	.7	3.7	7.0	2.0	2.7	2.5	4.4	3.6	4.6	3.5	3.3	1.1	39.1
1897	3.6	1.9	3.2	3.3	4.9	3.6	7.2	3.8	3.0	1.0	4.4	3.2	43.1
1898	4.9	6.8	1.0	2.2	1.6	3.3	1.5	3.7	3.3	4.4	4.3	1.3	38.3
1899	2.4	3.3	4.6	.9	2.2	1.8	5.4	.9	3.0	1.5	2.4	2.5	30.9
1900	5.6	6.8	5.0	1.3	4.6	3.9	4.6	1.8	3.1	3.4	6.5	1.9	48.5
1901	2.7	1.5	3.9	6.0	2.3	3.8	3.9	3.9	2.2	2.8	2.3	7.6	42.9
1902	2.9	3.0	8.3	3.3	4.3	6.1	2.7	4.5	3.8	4.9	1.2	4.0	49.0
1903	3.9	3.4	5.6	1.9	.5	4.8	4.8	2.9	.9	2.7	1.4	2.9	35.7
1904	3.0	1.5	2.9	5.4	5.8	2.9	5.1	4.9	5.8	2.4	1.5	1.6	42.8
1905	3.9	1.1	1.3	2.1	3.1	3.9	4.2	2.1	4.2	1.0	3.4	2.9	33.2
1906	2.8	2.3	4.6	2.9	3.9	4.4	......	......	......	......	......	......	....
Mean, 1891-1905.	......	......	......	......	......	......	......	......	......	......	......	......	39.82

SNOW STORAGE AND WATER EQUIVALENT.

The measurement of snowfall by catching it in the ordinary rain gage, as rain is caught in the summer season, is liable to considerable error, owing to the deflection of air currents by the gage. The snowflakes being light, tend to be carried over or diverted from the mouth of the gage, especially when considerable wind is blowing. It is therefore desirable to supplement winter precipitation records, obtained by the use of the rain gage with measurements of the actual depth of snow upon the ground from time to time, taken at some level place where an average depth prevails, and with determinations of the water equivalent of the snow, obtained by melting a prism of it. Records of this nature have been kept since the winter of 1903–4 at several of the precipitation stations in the Kennebec basin, and the data thus obtained are presented in the following table:

Water equivalent of snow in Kennebec basin.

Station.	Date.	Depth of snow.	Water equivalent.	Ratio: Water to Snow
		Inches.	*Inches.*	
Grant farm	February 11, 1904	20	5.92	0.296
Do	April 21, 1904	....	5.88	....
Do	December 31, 1904	15	1.55	.103
Do	March 1, 1905	33	7.78	.236
Do	December 31, 1905	11	2.4	.218
Do	January 28, 1906	40	8.25	.206
Chesuncook	February 7, 1904	27	4.03	.149
Do	March 11, 1904	12	1.20	.100
Do	do	14	1.32	.094
Do	do	16.5	1.44	.087
Do	February 22, 1905	25	4.3	.172
Do	March 27, 1905	10	4.0	.400
Do	November 12, 1905	12	1.56	.130
Do	January 1, 1906	15	2.75	.183
Do	February 1, 1906	10.33	4.10	.397
Do	February 16, 1906	17	2.97	.175
Do	March 15, 1906	22	5.96	.271
Greenville	December 16, 1905	12	1.89	.158
Do	December 30, 1905	10	1.85	.185
Do	January 17, 1906	12	2.5	.208
Do	February 17, 1906	11	2.05	.186
Do	March 6, 1906	9	2.22	.247
Do	March 19, 1906	13	3.58	.275
Do	March 28, 1906	48	11.85	.247
Jackman	February 2, 1904	28	6.20	.221
Do	January —, 1905	23	3.2	.139
Do	March 22, 1905	23	5.2	.226
The Forks	February 4, 1904	20	4.16	.208
Do	February 29, 1904	18	4.33	.240
Do	March 8, 1904	24	6.20	.258
Do	do	18	5.30	.294
Do	April 20, 1904	9	3.54	.395
Do	January 17, 1905	27	5.4	.200
Do	February 1, 1905	27	5.3	.196
Do	February 15, 1905	35	7.0	.200
Do	March 2, 1905	28	5.5	.196
Do	March 16, 1905	23	5.4	.234
Do	December 15, 1905	12	1.5	.125
Do	January 15, 1906	[a] 14	3.6	.257
Do	February 17, 1906	22	5	.227
Do	March 15, 1906	34	6.5	.191
Do	April 15, 1906	16	5.6	.350
Madison	March 19, 1903	10	4.60	.460
Do	February 26, 1904	32	4.83	.151
Do	February 3, 1905	26	5.46	.210
Winslow	January 15, 1905	17	4.27	.251
Do	March 1, 1905	32	8	.250
Do	March 15, 1905	27	7.5	.278

[a] Heavy; one-half inch ice on ground.

Fig. 4 shows graphically the water equivalent of snow on the ground at The Forks, determined at different times during the last three seasons. A comparison of all the stations in the previous table indicates that The Forks is fairly representative of the whole Kennebec basin, as regards depth of snow and its water equivalent, so that this diagram may be said to show approximately the snow storage of water in the basin during the last three winters.

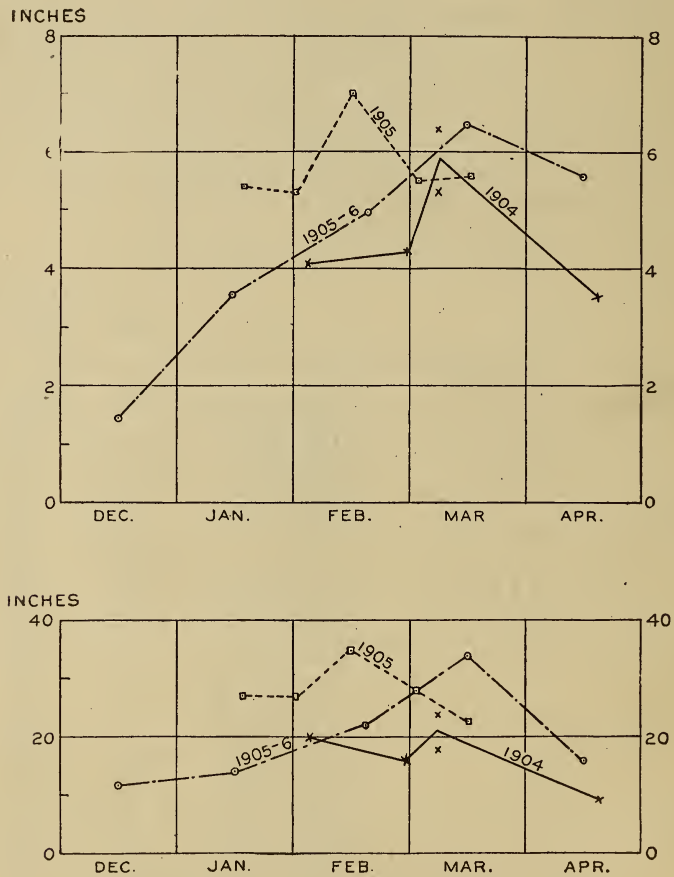


FIG. 4.—Water equivalent of snow on the ground at The Forks, Me.

STREAM FLOW.

SOURCES OF INFORMATION.

The water flowing in surface streams forms one of the most valuable natural assets of any country and is an important factor in the development of its commercial and agricultural resources. Data in regard to the regimen and total flow of streams and of the conditions which affect this flow are of primary importance to their economic use.

Users of surface waters have for a long time recognized the value of data in regard to flow, and have collected much information relative to the streams in which they are interested. The general demand for information on this subject led to the organization of the hydrographic work of the United States Geological Survey, and as a result records of discharge for the more important streams in the United States are now generally available.

In the Kennebec basin the water users have been active for many years in keeping records of gage height and discharge; in fact, it was chiefly owing to the interest shown here and the urgent requests from this part of the State for more extended information that hydrographic work was begun by the United States Geological Survey in Maine in 1901. Since that time systematic measurements of flow have been carried on by the Survey, not only in the Kennebec basin but on most of the important rivers of the State. The combined records from these two sources furnish a most valuable collection of facts relative to the water resources of this area. The following pages contain a compilation of these data, which have been carefully revised and adjusted in accordance with the best information available to date.

FIELD METHODS.

Data collected by private parties have generally been obtained at power plants where the discharge is divided, part going over a dam, part through the wheels, and part through by-channels. The flow over the dam is obtained from the measured head by the use of a weir formula, that through the wheels by the use of each wheel as a meter, and that through the by-channels by means of weirs or by current-meter measurements. The sum of these components is the total discharge of the river at the section. The general methods used at stations of this character are fully described in Water-Supply Paper No. 150 [a] (Weir experiments, coefficients, and formulas, by R. E. Horton), and the use of turbines for measurement purposes is explained in detail in Water-Supply Paper No. 180 (Turbine water-wheel tests and power tables, by R. E. Horton).

The Geological Survey has generally collected its data at current-meter gaging stations located at points at which it is considered that the information will be of special value. At these stations observations of stage, or gage height, of discharge, and of general conditions form the base data for computing the daily and total flow of the stream. The methods used in selecting current-meter stations and in collecting data are fully described in Water-Supply Papers Nos. 94 and 95. They may be briefly stated as follows:

[a] The first edition of the paper has been exhausted. The second edition, including revisions and some additional data, has been published as Water-Supply Paper No. 200.

The selection of a site for a gaging station depends primarily on the facilities for making the measurements of discharge, and these stations have accordingly been classified as bridge, cable, boat, or wading stations. Pl. II, *A*, shows a typical cable station. The length of time a station is maintained depends largely on the needs of each locality and the facilities for making the measurements. If the water is to be used for power, special effort is made to obtain information concerning the minimum flow; if water is to be stored, the maximum flow also receives special attention. In all sections of the country permanent gaging stations are maintained for general statistical purposes, to show the conditions existing through long periods. They are also used as primary stations, and in connection with short series of measurements serve as a basis for estimating the flow at other points in the drainage basin.

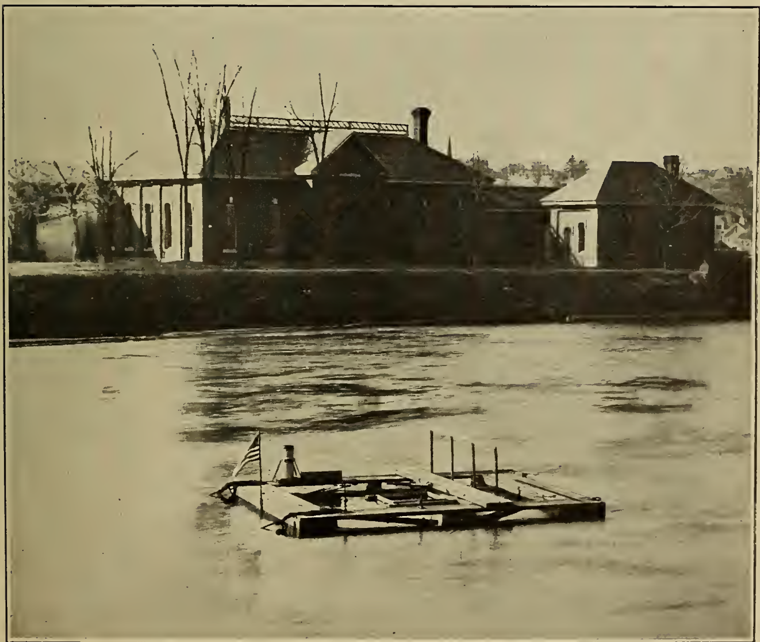
The gage heights are observed daily on the vertical staff or some other type of gage, by some person living near by. The average of the gage readings, if more than one is taken in any day, is used as the mean gage height for that day.

The measurements of discharge, which determine the quantity of water flowing past the gaging station at a given stage and time, are made by hydrographers of the Survey, who visit the stations at intervals. This discharge is the product of the area, which is obtained by soundings, and the velocity of the current, which is usually measured by some type of current meter.

The current meter is primarily an instrument for measuring the velocity of moving water, and consists essentially of a wheel with vanes, which may be shaped like those of a windmill or of a screw, or with cups like those of an anemometer, the necessary qualification being that moving water shall readily cause the wheel of the meter to turn. Each meter is rated before use. The rating is done by moving the meter through still water at various observed speeds to determine the relation between the velocity with which the meter moves through the water and the revolutions of the wheel. This relation having been determined, the meter is used in running water, the revolutions per unit of time noted, and the velocity of the water computed.

In making the measurements an arbitrary number of points are laid off on a line perpendicular to the thread of the stream. At these points the velocity and depth are observed. They are known as measuring points, being usually fixed at regular intervals, varying from 2 to 20 feet, depending on the size and conditions of the stream. Perpendiculars dropped from the measuring points divide the gaging section into strips. For each strip or pair of strips the mean velocity, area, and discharge are determined independently, so that conditions in one part of the stream may not be extended to parts where they do not apply.

A. CABLE STATION ON MOOSE RIVER AT ROCKWOOD, ME.



B. EVAPORATION AND RAINFALL STATION ON ANDROSCOGGIN RIVER AT LEWISTON, ME.

OFFICE METHODS.

For obtaining the daily discharge at current-meter gaging stations it is necessary that sufficient measurements be taken to cover the range of stage as indicated by the gage heights. With these and the other information in regard to the station, it is possible to construct a rating table which will give the discharge corresponding to any stage of the stream.

The construction of the rating table depends on the following laws of flow for open permanent channels: (1) The discharge will remain constant so long as the conditions at or near the gaging station remain constant; (2) the change of slope due to the rise and fall of the stream being neglected, the discharge will be the same whenever the stream is at a given stage; (3) the discharge is a function of the stage and increases gradually with it.

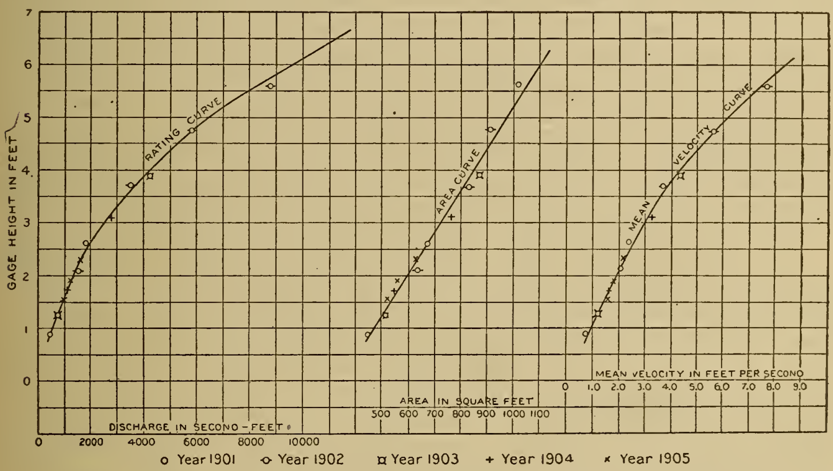


FIG. 5.—Rating, area, and mean velocity curves for Kennebec River at The Forks, Me.

The plotting of results of the various discharge measurements, gage heights being used as ordinates, and discharge, mean velocity, and area as abscissas, will define curves which show the discharge, mean velocity, and area corresponding to any gage height. Fig. 5 shows a typical rating curve, that for the gaging station on Kennebec River at The Forks, with its corresponding mean velocity and area curves.

As the discharge is the product of two factors, the area and the mean velocity, any change in either factor will produce a corresponding change in the discharge. Their curves are therefore constructed in order to study each independently of the other.

The area curve can be definitely determined from accurate soundings extending to the limits of high water. It is invariably either concave toward the horizontal axis or a straight line, unless the banks of the stream are overhanging.

The form of the mean velocity curve depends chiefly on the surface slope, the roughness of the bed, and the cross section of the stream. Of these the slope is the principal factor. In accordance with the relative change of these factors the curve may be either a straight line, convex or concave toward either axis, or a combination of the three. From a careful study of the conditions at any gaging station the form which the velocity curve will take can be predicted, and it may be extended with reasonable certainty to stages beyond the limits of actual measurements. Its principal use is in connection with the area curve in locating errors in discharge measurements and in constructing the rating table.

The discharge curve is defined primarily by the measurements of discharge, which are studied and weighted in accordance with the local conditions existing at the time of each measurement. Between and beyond the measurements the curve may, however, best be located by means of curves of area and mean velocity. This curve under normal conditions is concave toward the horizontal axis and is generally parabolic in form.

In the preparation of the rating table the discharge for each tenth or half-tenth on the gage is taken from the curve. The differences between successive discharges are then taken and adjusted according to the law that they shall be either constant or increasing.

The determination of flow of an ice-covered stream is much more difficult and expensive than that for the open season, on account of frequent unstable conditions of ice cover and general lack of information in regard to the laws of flow of water under ice. This subject has been taken up in a preliminary way in Water-Supply Paper No. 187 (Determination of stream flow during the frozen season, by H. K. Barrows and R. E. Horton), which also contains a large amount of data regarding the flow of Kennebec River at North Anson during the frozen season and a description of methods used.

DEFINITIONS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as second-feet, gallons per minute, miner's inch, and run-off in second-feet per square mile, and (2) those which represent the actual quantity of water, as run-off in depth in inches and acre-feet. Those used in this report may be defined as follows:

"Second-feet" is an abbreviation for cubic feet per second and is the rate of discharge of water flowing in a stream 1 foot wide and 1 foot deep at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly, both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

EXPLANATION OF TABLES.

As far as available the following data are given for each regular gaging station:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. Tables of daily flow for stations located at dams.
6. Table of monthly and yearly discharges and run-off.

The descriptions of stations give such general information about the locality and equipment as would enable the reader to find and use the station; also, as far as possible, a complete history of all the changes that have occurred since the establishment of the station that would be factors in using the data collected.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, the gage height, and the discharge in second-feet.

The table of daily gage heights gives the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. At most stations the gage is read in the morning and in the evening.

The rating table gives discharges in second-feet corresponding to each stage of the river as given by the gage heights.

The table of daily flow gives the mean discharge for the day.

In the table of monthly discharges the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest. This is the flow as given in the rating table for that mean gage height. As the gage height is the mean for the day, there might have been short periods when the water was higher and the corresponding discharge larger than given in this column. Likewise in the "Minimum" column the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow for each second during the month. On this the computations for the remaining columns, which are defined above, are based.

ACCURACY OF DETERMINATIONS.

After the description of each gaging station a statement is made of the probable percentage of error in the figures for mean monthly flow. No refinement has been attempted in the determination of this percentage, which is only approximate, and which is based principally on the error of the discharge measurements with reference to the rating curve and the known conditions of flow in the vicinity of the gaging section. It is impossible to determine closely all errors caused by temporary or gradual changes in the conditions of flow, unreliability or ignorance of the observers, changes in chain length, or ice conditions.

Errors due to changes in conditions of flow are relatively small for large streams, except at very low stages. On small streams, however, a temporary obstruction at or below the gaging section, causing a change in area of cross section or in velocity of the current, may produce large errors in the computed daily discharge. As a rule, these changes do not occur frequently and are of a temporary character. For example, the lodging of logs on the controlling point below the gage reduces the velocity and hence the discharge for a given gage height. A few days later a sudden rise in the stream may clear the channel and restore normal flow. Unless the hydrographer has chanced to make a measurement of discharge during the period of abnormal conditions an error has been introduced into the computed daily and monthly flow. Owing to the limited appropriation for stream gaging and the large number and wide separation of the gaging stations, it is impossible for the hydrographers to make measurements frequently enough to eliminate all errors arising from these abnormal conditions. It has further been found impracticable, as a rule, so to instruct the observers that they will correctly report unusual conditions.

Gradual changes in the conditions which affect the flow can be estimated and corrected more readily than temporary changes. Here, again, the hydrographer is often handicapped by inability to make sufficient measurements to show properly the varying rate of change in channel conditions. In such cases the daily discharges are obtained either by an indirect method based on the assumption of a constant rate of change from day to day between measurements or by a series of rating curves.

Observers are, as a rule, conscientious in reading the gages, but with few exceptions they are wholly unfamiliar with engineering work of any description. The observers' records, however, are examined and checked by hydrographers and large errors are thus eliminated. The observers are usually instructed to read the gage to the nearest tenth or half tenth twice each day, and at times of floods several times a day. In high and medium stages the errors in reading the gage are thus negligible, but in low stages, when a difference of one or two hundredths in the stage of the river or slight fluctuations during the day cause errors of several per cent, it is evident that the regular method of observation is inadequate. Hence monthly minimums may be considerably in error, but it is believed that in general the monthly means for months of low flow are good owing to the tendency of positive and negative errors to offset each other.

All gages maintained by the Survey are checked with a level at least once each season, and oftener where conditions are such that the gage tends to settle or change position. Gage readings are corrected, where necessary, on the basis of these levels, and it is believed that no errors of any consequence in gage heights have occurred from this source.

Beginning with the winter of 1903–4, facts regarding ice cover and extent of frozen conditions have been noted at several of the gaging stations by the observers. No attempt has been made to give winter records of flow, except for Kennebec River at North Anson. These are based on numerous current-meter measurements and are for the most part probably correct within 10 to 15 per cent. The Hollingsworth & Whitney records of flow at Waterville are probably not in serious error during the winter season, as at this time most of the water is used through the wheels, which are not affected by ice conditions.

The errors described in the foregoing paragraphs are not to be considered as applying to every station. They have been fully treated here in order to call to the attention of the reader the possible sources of error and the limitations of engineering work of this kind. Although the resulting probable error may seem large, it should be remembered that stream-gaging data and records of flow are used mainly as a basis for predicting the maximum, minimum, and mean discharge of a stream to be expected in future years. Since the mean annual flow of a stream may be several times larger one year than it is the next, it is seen that for records of short duration an estimate which involves an error even as great as 50 per cent is not without value. On the other hand, it is a waste of money and needless refinement—indeed, virtually impossible—to obtain values much closer than 3 per cent in ordinary current-meter work.

Special emphasis is laid on the fact that the value of stream-gaging data is determined mainly by the number of years during which the record has been maintained, and not so much by the degree of accuracy of the mean discharge for each year; that is, the longer the record the more nearly does it give the maximum, minimum, and mean flow which may be expected in the future.

Monthly means which are stated in the descriptions to be within 5 per cent of the true flow are considered to be very good, and those within 10 per cent are considered close enough for all practical purposes. Errors in monthly means which are greater than 15 per cent are due either to an insufficiency in the number of measurements, or to poor natural conditions which could not be avoided, or to changes at the gaging station which could not be foreseen at the time of its establishment. It should further be noticed that the larger errors occur in daily discharges at the highest stages, which continue only for a few days, and hence the effect on the accuracy of the monthly mean is not so great as might at first appear. Also by far the greater number of gage heights are for medium stages, where the error of the rating curve is rarely as great as 10 per cent and is usually much less than 5 per cent. The errors of the daily discharges are often considable, owing to fluctuation of the river height. The maximum and minimum flow for the month may also have an additional error, due to the fact that they are based on the extreme low or high part of the rating curve, which is usually not so well defined as the intermediate portion. In the mean monthly flow, however, for which the estimates of accuracy are made, the error is reduced to a very small amount, owing to the compensation of variable negative and positive errors.

USE OF DATA ON STREAM FLOW.

In the consideration of the development of enterprises which depend largely on the use of water, it is essential to have detailed and accurate information in regard to flow. This information should include data for the total flow of the year and its distribution by days, months, and seasons.

The total flow is given in the table headed "Maximum, minimum, and mean discharge," which also gives the maximum and mean for the months stated, and shows in a general way the conditions that may be expected at the station.

The daily distribution and duration of flow may be found either from the tables of daily discharge or by the use of gage height and rating tables. For determining the duration, the discharges or gage heights should be tabulated according to their size, and under each should be entered the number of days on which it occurs during the year. By adding these figures for successive years and averaging the totals a result may be obtained showing the average number of days during the year when the stage and discharge are above or below a given amount. These values may also be plotted in a curve.

When estimates of flow are desired at points on a stream other than those where continuous measurements have been made, great care must be taken in applying these published data. Very frequently it is found that different portions of the same drainage area will differ greatly in run-off and the general regimen of flow. Hence serious error may arise in applying these data on flow by simply comparing drainage areas at the two points, and such an application should never be made unless it is based also on a knowledge of the conditions affecting flow, the relative amount of lake or pond surface, the geologic, topographic, and forest conditions, etc. It is always best to make a few actual measurements of flow at the desired point and compare these with the flow at the same time at the regular station; or, better still, to erect a temporary gage and carry observations over several weeks or more. In this way the long-time records of the Survey can be used at various places along the river and made of general value.

LOCATION OF STATIONS.

The location of the various gaging stations for which data regarding flow are here given, is indicated on Pl. I, by letters, and in the following table:

Gaging stations in Kennebec basin.

Letter on Pl. I.	River.	Location.	Date established.	Established by—
A	Kennebec	The Forks	September 28, 1901	U. S. Geological Survey.
B	do	North Anson	October 18, 1901	do.
C	do	Waterville	January 12, 1893	Hollingsworth & Whitney Co.
D	Moose	Rockwood	September 7, 1902	U. S. Geological Survey.
E	Roach	Roach River	November 10, 1901	do.
F	Dead	The Forks	September 29, 1901	do.
G	Carrabassett	North Anson	October 19, 1901	do.
H	Sandy	Madison	March 23, 1904	do.
I	Messalonskee	Waterville	June 18, 1903	do.
J	Cobbosseecontee	Gardiner	June 16, 1890	Gardiner Water Power Co.

KENNEBEC RIVER AT THE FORKS.

This station was established September 28, 1901, by N. C. Grover, at the wooden highway bridge across Kennebec River at The Forks, about 2,000 feet above the mouth of Dead River. Of the drainage area at this station, 1,240 square miles are tributary to Moosehead Lake and the remaining 330 square miles drain into the Kennebec by small streams with steep slopes and no storage. Practically all land surfaces above this point are in forest.

The channel is straight for 200 feet above and 500 feet below the station, is unbroken by piers, and is about 125 feet wide at ordinary stages of the river. The current is swift at high and medium at low stages. The banks are high and rocky, and the bed is rocky and permanent.

Discharge measurements are made from the bridge. The initial point for soundings is on the left bank, marked by a rod across the bridge, just above the abutment and below the bridge floor.

From about May 1 to July 31 considerable fluctuations in gage height, ranging in amount from 2 to over 5 feet, occur daily, owing to the regulation of the flow at Indian Pond dam, for the purpose of log driving. The morning and evening records obtained by the observer represent the maximum and minimum heights of each day during this period, as well as can be determined. The mean daily discharge during this period for the years 1903 to 1905, as given on page 39, is computed by averaging the discharges as applied to the morning and evening gage heights, account being taken also of the relative length of the high and low water periods. From April 23 to August 9, 1906, four daily gage readings were made and used in computing the daily flow.

There are two gages—one, a vertical rod, is attached to the timber retaining wall on the left bank, about 75 feet above the bridge; the other is a standard chain gage attached to the bridge floor. The length of the chain is 17.08 feet. Gage-height observations are made twice each day by William W. Young. The datum of the two gages is the same and is referred to bench marks as follows: (1) The top of a bolt on the east abutment, on the north side of the bridge; elevation, 12.85 feet; (2) a marked point on the floor of the bridge near the east end of the gage box; elevation, 15.42 feet. Elevations are above gage datum, which is 565.44 feet above mean sea level, as determined by the Kennebec River survey of 1904 and readjusted in 1906.

All estimates previously published for years prior to 1905 have been revised on the basis of the 1905 rating curve.

Values for monthly means as given herewith are considered to be well within 5 per cent of the true flow. Daily discharges are subject to much larger errors, particularly above gage height 6.0 feet and during the log-driving season.

Discharge measurements of Kennebec River at The Forks.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1901.	*Feet.*	*Sec.-ft.*	1904.	*Feet.*	*Sec.-ft.*
September 28	2.60	1,860	July 27	1.70	1,060
October 20	.90	473	August 29	3.12	2,720
1902.			1905.		
April 25	3.70	3,500	April 21	1.90	1,200
June 16	5.60	8,860	July 18	1.53	950
June 25	4.75	5,900	September 4	2.30	1,600
September 29	2.10	1,480	1906.		
1903.			September 5	2.70	2,200
August 18	3.95	4,180			
November 4	1.26	757			
Do	1.26	759			

Daily gage height, in feet, of Kennebec River at The Forks.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1901.[a]					1901.[a]				
1	....	2.4	2.6	....	17	....	1.4	2.0	8.0
2	....	2.4	2.6	....	18	....	1.1	2.0	7.0
3	....	2.4	2.6	....	19	....	1.2	2.0	6.0
4	....	2.4	2.6	....	20	....	.9	2.0	....
5	....	2.5	2.5	....	21	....	1.9	2.0	....
6	....	....	2.3	....	22	....	1.7	2.0	....
7	....	2.4	2.2	....	23	....	2.0	2.0	....
8	....	2.4	2.1	2.5	24	....	2.8	2.0	....
9	....	2.5	2.2	....	25	....	2.9	2.0	....
10	....	2.5	1.9	3.0	26	....	2.9	2.0	....
11	....	2.4	1.8	3.0	27	....	2.05	2.0	....
12	....	2.55	1.7	3.0	28	....	2.0	2.0	....
13	....	2.55	1.8	3.4	29	2.6	2.0	2.0	....
14	....	2.65	1.7	4.0	30	2.5	2.5	2.0	....
15	....	2.95	2.0	9.0	31	....	2.5	....	....
16	....	2.0	2.0	8.0					

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1902.[b]												
1	......	......	....	8.6	6.85	4.1	6.0	4.5	1.95	2.05	1.1	......
2	......	......	2.55	8.4	8.05	5.75	6.15	4.5	1.95	1.8	1.1	......
3	......	......	2.9	8.1	8.2	6.35	6.1	5.65	1.95	1.6	1.1	......
4	......	......	3.1	7.95	8.2	6.5	6.0	4.05	2.4	2.0	1.45	......
5	......	......	3.0	7.55	6.4	7.55	5.8	4.05	2.35	2.05	1.3	......
6	......	......	2.95	7.15	6.05	7.8	5.8	3.8	2.6	2.0	1.45	......
7	......	......	2.7	6.4	6.25	7.5	5.4	3.5	2.55	2.05	1.5	......
8	......	......	2.85	6.6	6.25	7.6	4.8	3.4	2.65	2.05	1.5	......
9	......	......	2.7	6.5	6.7	7.7	4.75	3.4	2.7	2.0	2.0	......
10	......	......	2.6	6.45	6.35	7.8	4.5	3.4	2.65	1.8	2.0	......
11	......	......	2.6	6.3	6.7	6.7	4.55	3.5	2.6	1.6	2.0	......
12	......	......	2.0	5.35	6.8	6.4	4.5	3.5	2.55	1.6	2.1	......
13	......	......	1.6	5.5	6.7	6.1	5.8	3.3	2.5	1.95	2.05	......
14	......	......	1.6	5.3	7.1	5.8	4.95	3.35	2.45	2.0	2.1	......
15	......	......	1.5	5.25	6.9	7.3	4.65	3.15	2.4	2.05	2.0	......
16	......	......	1.45	5.6	5.5	5.7	4.75	3.0	2.3	2.2	......	......
17	......	......	2.0	5.6	5.75	5.55	4.65	3.05	2.1	2.2	......	......
18	......	......	2.55	5.7	5.3	5.45	4.65	3.0	2.0	1.6	......	......
19	......	......	2.9	5.9	5.5	5.9	4.65	2.95	2.0	2.0	......	3.0
20	......	......	3.8	5.85	4.5	5.9	4.65	2.75	2.0	2.1	......	3.0
21	......	......	4.0	6.1	4.9	4.7	4.65	2.85	2.5	2.5	......	3.0
22	......	......	4.3	6.25	4.9	5.5	4.5	2.8	2.8	2.35	......	3.0
23	......	......	4.4	5.8	4.8	5.15	5.2	2.8	2.5	2.55	......	3.0
24	......	......	4.3	5.05	5.0	5.2	3.8	2.8	2.05	2.45	......	3.0
25	......	......	3.85	4.4	5.6	6.1	2.7	2.8	2.45	2.6	......	3.0
26	......	......	3.5	3.75	6.5	5.3	2.9	2.6	2.0	2.4	......	3.0
27	......	......	3.6	4.8	6.5	5.55	3.15	2.2	2.25	2.4	......	3.0
28	......	......	4.0	6.05	4.5	4.45	4.25	2.0	2.15	2.55	......	......
29	......	......	4.35	6.1	4.0	4.3	4.15	2.0	2.1	2.55	......	......
30	......	......	6.0	6.0	3.75	4.8	4.15	2.0	2.15	2.5	......	......
31	......	......	7.8	....	4.6	....	4.3	2.1	....	1.8	......	......
1903.[c]												
1	......	......	3.9	2.55	3.45	......	......	......	2.5	2.4	1.3	1.0
2	......	......	3.8	2.45	3.5	......	......	......	2.55	2.35	1.3	1.0
3	......	3.0	......	4.45	2.75	......	......	......	2.65	2.3	1.3	1.0
4	......	3.0	......	6.15	3.1	......	......	......	2.7	2.25	1.3	1.0
5	......	3.0	3.7	6.45	2.9	......	......	......	2.65	2.2	1.3	1.0
6	......	3.0	3.65	7.05	3.3	......	......	......	2.75	2.2	1.3	1.0
7	......	3.0	3.6	6.8	3.1	......	......	......	3.0	2.2	1.3	1.0
8	......	3.05	3.55	6.8	3.65	......	......	......	2.9	2.1	1.3	1.0
9	......	3.3	3.6	6.8	4.3	......	......	......	2.9	1.65	1.3	1.0
10	......	3.3	3.65	6.9	3.55	......	......	......	2.75	1.5	1.3	1.0
11	......	3.35	3.9	6.9	3.55	......	......	......	2.65	1.5	1.2	1.05
12	......	3.45	2.75	5.95	3.9	......	......	......	2.6	1.65	1.2	1.0
13	......	3.35	2.75	3.2	3.85	......	......	......	2.6	1.6	1.2	1.05
14	......	3.3	3.0	3.65	4.15	......	......	......	2.6	1.6	1.2	1.3
15	......	3.25	3.05	5.65	3.45	......	......	......	2.5	1.1	1.2	1.25

[a] Ice conditions December 20 to 31, 1901.
[b] River frozen January 1 to March 1 and December 28 to 31, 1902.
[c] River frozen January 1 to February 2, 1903.

Daily gage height, in feet, of Kennebec River at The Forks—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
16		3.2	3.05	6.4					2.5	1.7	1.2	(a)
17		3.2	3.0	6.95					2.5	1.7	1.2	
18		3.2	2.9	7.05					2.4	1.9	1.2	
19		3.2	2.75	6.85					2.45	1.85	1.2	1.6
20		3.2	3.15	6.75					2.35	1.8	1.2	1.45
21		3.2	3.75	6.55					2.25	1.7	1.1	2.4
22		3.2	3.85	6.45					2.2	1.65	1.1	1.8
23		3.2	4.05	6.3				3.45	2.6	1.5	1.1	1.6
24		3.2	4.1	6.05				2.9	2.6	1.5	1.1	1.6
25		3.2	4.45	5.6				2.85	2.55	1.55	1.0	1.7
26		3.25	4.05	3.1				2.6	2.45	1.5	1.0	1.6
27		4.2	3.7	3.0				2.6	2.4	1.5	1.0	1.5
28		4.2	3.35	3.7				2.5	2.45	1.5	1.0	1.5
29			3.05	3.85				2.6	2.4	1.5	1.0	1.4
30			2.7	3.5				2.55	2.4	1.3	1.0	2.0
31			2.75					2.5		1.3		2.0
1904.[b]												
1	1.9	2.3	[c]2.4	2.0	4.85				3.05	2.6	1.45	2.1
2	[d]1.9				4.25				3.1	2.35	1.4	2.1
3				1.5	3.7				3.6	2.05	1.4	2.1
4		[e]2.3		.8	3.5				4.1	1.85	1.4	[f]2.5
5				.8	3.4				4.05	1.95	1.55	[f]2.4
6				.9	3.4				3.85	1.5	1.7	[f]2.4
7	[c]2.0		[c]2.2	1.1	3.3				3.3	1.35	2.5	[f]2.6
8			2.4	[g]1.2	3.3				3.05	1.3	2.65	[f]2.7
9	[c]1.9		2.5	[g]6.8	3.2				2.9	1.3	2.15	[f]2.8
10			[c]2.5	[g]2.6	3.7				2.8	1.6	2.1	[f]3.1
11		[e]2.6		[g]3.2	5.3				2.7	2.3	1.95	[f]3.2
12	[e]1.9	[h]2.6	[c]2.3	[g]3.7	4.8				2.6	2.85	2.0	3.3
13	1.9	[h]2.6		2.8	4.0				2.6	3.05	2.15	3.3
14	2.1			2.8					2.65	3.1	2.3	3.5
15		2.6		3.1					2.95	3.1	2.2	3.5
16	[e]2.0		[c]2.1	3.1					2.2	3.05	2.3	3.8
17				2.9					1.9	3.0	2.2	3.8
18		[e]2.4		1.8					1.8	2.65	2.2	4.0
19	[e]2.0		2.3	2.1					1.7	2.4	2.15	4.1
20		2.4	[h]2.4	1.7					1.5	2.3	2.1	4.1
21	[e]2.0		2.4	1.7					1.5	2.25	2.15	4.2
22	[e]2.0			1.8					1.7	2.55	2.1	4.4
23				1.9				1.5	1.75	2.3	2.05	4.2
24			2.4	2.65				1.75	2.0	2.05	2.05	4.4
25	[e]2.3		2.4	3.35				2.0	2.6	2.4	2.0	4.6
26			2.4	3.2				2.25	2.6	2.25	2.0	4.6
27		[e]2.4	2.4	3.25				2.55	2.55	2.0	2.05	4.6
28	[e]2.3		2.3	3.3				3.1	2.7	1.7	2.0	4.8
29	[e]2.4		2.3	3.4				3.2	2.55	1.8	2.0	4.5
30			2.1	3.95				3.1	2.7	1.55	2.1	4.8
31			2.2					3.1		1.5		4.7

[a] Readings December 16 to 31, 1903, through ice.
[b] During frozen season 1904 gage readings are to surface of water in hole cut in ice.
[c] Ice 2.2 feet thick.
[d] Ice 1.4 feet thick.
[e] Ice 2 feet thick.
[f] Anchor ice caused backwater effect on gage; estimated as follows: December 4, 0.4 foot; December 5, 6, 0.3 foot; December 7, 0.5 foot; December 8, 10, 0.6 foot; December 9, 11, 0.7 foot.
[g] Ice from Dead River formed a jam a short distance below gage and caused backwater.
[h] Ice 2.1 feet thick.

Daily gage height, in feet, of Kennebec River at The Forks—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1905.[a]												
1	4.8	5.1	......	2.95	4.25	......	......	1.4	2.7	1.6	1.6	1.3
2	4.7	5.1	......	2.85	2.55	......	......	3.3	2.7	1.6	1.6	1.3
3	4.8	5.2	4.5	2.6	2.35	......	......	2.9	2.4	1.6	1.5	1.3
4	4.8	5.2	......	2.05	3.25	......	......	2.65	2.3	1.6	1.5	1.3
5	4.9	5.2	......	1.75	3.3	......	......	2.55	2.3	1.6	1.5	1.3
6	4.7	5.1	......	1.6	2.55	......	......	2.5	2.0	1.55	1.5	1.3
7	4.5	5.1	......	1.9	......	......	......	2.55	1.8	1.45	1.5	1.2
8	4.2	5.1	......	2.1	......	......	......	2.75	1.85	1.4	1.5	1.15
9	4.5	5.1	......	2.1	......	......	......	2.9	1.9	1.4	1.5	1.1
10	4.2	4.9	......	2.1	......	......	......	2.8	1.9	1.5	1.5	1.1
11	4.2	4.7	4.0	2.25	......	......	......	2.8	1.9	1.4	1.5	1.1
12	4.3	4.8	......	2.5	......	......	......	2.8	2.0	1.4	1.5	1.2
13	4.4	4.8	......	2.75	......	......	......	2.8	2.0	1.4	1.5	1.2
14	4.4	4.8	......	2.8	......	......	......	2.9	2.0	1.4	1.5	1.3
15	4.3	4.7	......	2.8	......	......	......	2.8	2.0	1.35	1.5	1.3
16	4.4	4.8	......	2.75	......	......	......	2.8	2.0	1.3	1.5	......
17	4.5	4.8	......	2.55	......	......	......	2.8	1.9	1.25	1.5	......
18	4.5	......	3.8	2.3	......	......	......	2.75	1.8	1.2	1.4	3.7
19	4.6	......	......	2.05	......	......	......	2.65	1.8	1.2	1.4	......
20	4.5	......	3.6	2.15	......	......	......	2.6	1.8	1.2	1.35	......
21	4.5	4.9	3.5	1.9	......	......	......	2.6	1.8	1.2	1.3	......
22	......	......	3.5	2.3	......	......	......	2.5	1.7	1.2	1.3	......
23	4.6	......	3.5	2.4	......	......	......	2.5	1.7	1.2	1.15	......
24	4.9	4.7	3.5	2.0	......	......	......	2.5	1.7	1.2	1.1	......
25	4.9	......	3.4	2.0	......	......	......	2.85	1.7	1.45	1.2	3.4
26	4.9	......	2.55	2.15	......	......	......	2.75	1.6	1.55	1.2	......
27	5.0	......	2.3	2.55	......	......	......	2.75	1.5	1.7	1.2	......
28	5.0	......	2.35	2.65	......	......	......	2.75	1.4	1.7	1.2	......
29	5.0	......	2.25	2.65	......	......	......	2.75	1.5	1.7	1.2	......
30	5.0	......	2.0	2.55	......	......	......	2.7	1.6	1.6	1.3	......
31	5.0	......	2.3	......	......	......	......	2.7	......	1.6	......	......

[a] Ice conditions January 1 to March 26 and December 16–31, 1905. January 24, gage reader estimates backwater effect of 0.2 foot due to ice; channel open 80 feet wide at the gage. January 29, channel open about 10 feet wide at the gage. February 1, river frozen over at the gage. Most of the ice went out during the week of March 20–26. December 18, rise in river due to anchor ice; estimated gage height, 2.1 feet. During frozen period gage heights are to the surface of the water in a hole cut in the ice. The following comparative readings were taken:

Date.	Water surface.	Top of ice.	Thickness of ice.
1905.	*Feet.*	*Feet.*	*Feet.*
February 21	4.9	4.9	0.2
February 24	4.7	4.7	.8
March 3	4.5	4.1	.9
March 11	4.0	4.2	1.0
March 18	3.8	3.8	1.0
December 18	3.7	3.7	.25
December 25	3.4	3.4	.3

Daily gage height, in feet, of Kennebec River at The Forks—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1906.[a]												
1					3.45	4.8	4.3	3.9	3.3	1.6	1.05	0.8
2					4.25	5.4	5.0	3.9	3.3	1.7	.75	.8
3		4.7			4.45	5.2	4.8	3.95	3.15	1.7	1.0	1.0
4					4.45	3.9	4.6	3.25	3.0	1.7	1.45	1.45
5					4.65	5.0	4.9	3.6	2.75	1.7	1.3	1.8
6	2.9				4.75	6.05	4.7	3.7	2.7	1.6	1.3	1.85
7				2.4	4.55	6.2	4.65	3.3	2.7	1.6	1.25	
8					3.8	5.85	4.7	3.1	2.7	1.6	1.3	
9			4.3		3.85	4.9	4.7	3.75	2.7	1.6	1.3	
10		4.7			5.1	4.95	4.9	2.9	1.8	2.25	1.6	
11					6.0	5.0	4.75	2.8	2.6	2.9	1.55	
12					4.0	5.1	4.8	2.8	2.5	3.35	1.6	3.5
13	1.8				4.05	4.7	4.65	2.75	2.65	2.65	1.6	
14				2.2	4.5	4.35	4.15	2.7	2.6	1.75	1.1	
15				2.3	4.4	4.7	4.1	3.4	2.6	.9	1.0	
16			4.5	3.9	4.8	4.25	3.95	3.15	2.55	1.1	.7	
17		5.5		5.15	5.95	3.95	3.65	3.0	2.5	1.2	.6	
18				5.95	6.9	4.35	3.4	2.95	2.35	1.2	.6	
19				4.75	6.5	4.65	3.15	2.8	2.3	1.45	.95	
20	2.7			3.35	6.4	4.65	2.85	2.75	1.65	1.75	.75	
21				3.25	6.4	4.65	2.75	2.7	1.4	2.0	1.0	3.0
22				3.4	6.7	4.7	2.75	2.7	1.35	2.2	1.4	
23				[b] 3.45	5.9	4.65	2.7	2.85	1.4	2.2	1.45	
24		4.6	4.5	3.3	6.75	3.8	2.55	2.9	1.4	2.3	1.4	
25				3.0	6.4	1.9	3.1	2.8	1.4	2.55	.85	
26				3.0	5.6	2.15	3.8	2.8	1.4	2.85	.7	
27				2.75	6.05	4.95	3.4	2.8	1.4	2.25	.7	
28	4.6			2.7	6.2	4.6	3.4	3.35	1.4	2.0	.7	
29				2.7	5.95	4.5	3.7	3.5	1.4	1.9	.8	2.8
30				3.15	4.95	3.75	3.9	3.4	1.4	1.5	.8	
31			2.9		5.35		3.9	3.4		1.25		

[a] Ice conditions January 1 to April 20, 1906, when ice went out. January 28 to February 17, ice jam 1 mile long extended above and below the station. River also frozen over December 7 to 31, 1906. Gage heights affected by backwater December 4 to 6. During frozen period gage heights are to surface of water in a hole cut in the ice. The following comparative readings were taken:

Date.	Water surface.	Top of ice.	Thickness of ice.
1906.	*Feet.*	*Feet.*	*Feet.*
January 6	2.9	2.9	0.9
January 13	1.8	1.6	1.2
January 20	2.7	2.6	1.5
January 28	4.6	4.6	1.5
February 3	4.7	4.7	1.5
February 10	4.7	4.7	1.7
February 17	5.5	5.5	1.5
February 24	4.6	4.6	1.9
February 28	4.28	4.30	1.9
March 9	4.3	4.3	2.1
March 24	4.5	4.4	2.5
April 7	2.4	1.8	(1)
April 14	2.2		(1)
December 12	3.5	3.2	.4
December 21	3.0		.9
December 29	2.8	2.8	1.0

[1] Ice not safe.

[b] Gage heights April 23 to August 9, 1906, are the mean of four observed gage heights.

Rating table for Kennebec River at The Forks from September 29, 1901, to December 31, 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.60	340	1.90	1,220	3.20	2,775	5.00	6,525
0.70	390	2.00	1,305	3.30	2,935	5.20	7,050
0.80	445	2.10	1,395	3.40	3,100	5.40	7,590
0.90	505	2.20	1,490	3.50	3,270	5.60	8,140
1.00	565	2.30	1,590	3.60	3,450	5.80	8,720
1.10	630	2.40	1,700	3.70	3,635	6.00	9,315
1.20	695	2.50	1,815	3.80	3,825	6.50	10,870
1.30	765	2.60	1,935	3.90	4,020	7.00	12,520
1.40	835	2.70	2,060	4.00	4,220	7.50	14,250
1.50	910	2.80	2,190	4.20	4,635	8.00	16,070
1.60	985	2.90	2,325	4.40	5,070	8.50	17,950
1.70	1,060	3.00	2,470	4.00	5,535	9.00	19,890
1.80	1,140	3.10	2,620	4.80	6,020		

[a] This table is applicable only for open-channel conditions. It is based on 14 discharge measurements made during 1901–1906. It is well defined between gage heights 0.9 foot and 5 feet. The extension above 5 feet is based on the extension of the area and velocity curves, the latter being determined by means of tables based on Kutter's formula.

Daily discharge, in second-feet, of Kennebec River at The Forks.

Day.	May.	June.	July.	Aug.
1903.				
1	....	5,050	6,090	3,470
2	....	4,960	5,010	3,350
3	....	4,630	4,730	3,000
4	....	4,790	4,310	3,070
5	....	4,820	4,450	2,990
6	....	3,810	5,600	3,110
7	....	4,650	4,230	3,140
8	....	4,710	5,010	2,880
9	....	4,780	5,010	2,950
10	....	4,820	5,010	2,950
11	....	4,670	5,080	3,110
12	....	4,960	4,850	2,990
13	....	1,880	5,190	2,840
14	....	2,060	5,080	2,740
15	....	1,600	4,970	2,530
16	6,830	1,260	4,640	2,570
17	5,310	1,060	4,790	3,770
18	5,310	990	5,160	2,920
19	3,920	5,150	4,850	2,920
20	6,290	1,140	4,430	2,990
21	3,660	4,930	4,150	3,470
22	2,960	4,930	4,120	3,580
23	2,200	4,970	4,120	....
24	1,750	5,120	4,120	....
25	2,760	6,000	4,120	....
26	2,760	5,680	4,120	....
27	3,440	5,620	4,150	....
28	4,590	7,070	4,060	....
29	3,560	6,090	3,760	....
30	2,330	6,050	3,720	....
31	2,220	....	3,470	....
1904.				
1	....	6,120	5,730	1,690
2	....	5,450	5,820	1,970
3	....	8,330	6,860	3,810
4	....	6,460	6,560	3,810
5	....	7,940	6,340	3,940
6	....	6,460	5,510	3,810
7	....	8,930	5,560	3,550
8	....	4,840	5,500	3,430
9	....	5,780	5,540	3,550
10	....	5,210	5,690	4,210
11	....	6,340	5,720	3,980
12	....	7,180	6,670	4,820
13	....	8,050	7,340	4,530
14	3,490	8,240	7,170	5,110
15	4,330	6,700	6,500	3,850
16	4,010	6,410	6,500	1,460
17	5,530	7,340	5,570	4,060
18	5,890	5,630	6,130	3,290
19	8,220	5,630	5,660	3,290
20	7,100	8,860	5,620	3,130
21	6,110	8,030	5,210	1,670
22	2,570	7,200	6,580	1,620
23	7,000	5,600	5,310	....
24	4,630	4,970	5,650	....
25	8,100	5,010	5,190	....
26	5,180	5,460	4,570	....
27	5,400	6,070	4,290	....
28	5,140	5,920	4,120	....
29	6,460	5,730	4,960	....
30	6,460	5,420	4,020	....
31	6,460	....	3,310	....
1905.				
1	....	5,310	5,310	....
2	....	5,080	5,310	....
3	....	4,930	5,010	....
4	....	4,930	4,870	....
5	....	4,930	4,870	....
6	....	4,930	4,500	....
7	2,990	4,930	4,460	....
8	2,415	4,930	4,460	....
9	3,570	4,780	3,720	....
10	4,520	5,250	4,390	....
11	4,520	5,440	3,810	....
12	4,830	5,360	4,040	....
13	5,930	5,320	4,040	....
14	4,900	5,490	4,040	....
15	4,040	5,530	4,040	....
16	3,170	5,320	4,040	....
17	3,770	5,450	3,810	....
18	4,390	5,330	3,690	....
19	3,590	5,330	3,860	....
20	6,700	5,330	4,060	....
21	2,760	4,900	4,300	....
22	5,620	5,580	4,300	....
23	5,620	5,230	4,420	....
24	5,770	5,400	3,490	....
25	5,770	5,150	3,280	....
26	5,310	8,330	3,070	....
27	6,090	5,930	3,590	....
28	6,090	6,580	3,590	....
29	5,310	5,620	3,280	....
30	5,310	5,620	3,380	....
31	5,310	....	2,980	....

Monthly discharge of Kennebec River at The Forks.

[Drainage area, 1,570 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1901.					
October	2,470	505	1,588	1.01	1.16
November	1,935	1,060	1,401	0.892	1.00
December 8-19	19,890	1,815	7,711	4.91	2.19
1902.[a]					
March	15,330	872	3,277	2.09	2.41
April	18,330	3,730	9,999	6.37	7.11
May	16,810	3,730	9,503	6.05	6.98
June [b]	15,330	4,425	9,598	6.11	6.82
July [b]	9,775	2,060	6,059	3.86	4.45
August [b]	8,287	1,305	2,931	1.87	2.16
September	2,190	1,262	1,634	1.04	1.16
October	1,935	985	1,428	0.910	1.05
November 1-15	1,395	630	1,039	0.662	.37
December 19-27	2,470	2,470	2,470	1.57	.53
1903.[c]					
February 3-28	4,635	2,470	2,910	1.85	1.79
March	5,185	2,060	3,259	2.08	2.40
April	12,690	1,757	8,349	5.32	5.94
May	6,830	1,750	3,545	2.26	2.61
June	7,070	990	4,275	2.72	3.03
July	6,090	3,470	4,593	2.93	3.38
August	3,770	1,820	2,789	1.78	2.05
September	2,470	1,490	1,895	1.21	1.35
October	1,700	630	1,112	.708	0.82
November	765	565	684	.436	0.49
December 1-15	765	565	594	.378	0.21
1904.[d]					
April 10-30	4,120	1,060	2,291	1.46	1.14
May	8,220	2,570	5,059	3.22	3.71
June	8,930	4,840	6,510	4.15	4.63
July	7,340	3,310	5,652	3.60	4.15
August	5,110	910	2,966	1.89	2.18
September	4,425	910	2,118	1.35	1.51
October	2,620	765	1,564	.996	1.15
November	1,997	835	1,334	.850	.95
1905.[e]					
March 26-31	1,875	1,305	1,591	1.01	.23
April	2,400	985	1,666	1.06	1.18
May	6,700	1,645	4,330	2.76	3.18
June	8,330	4,780	5,408	3.44	3.84
July	5,310	2,980	4,065	2.59	2.99
August	2,935	835	2,067	1.32	1.52
September	2,060	835	1,248	.795	.89
October	1,060	695	864	.550	.63
November	985	630	838	.534	.60
December 1-15	765	630	717	.457	.25
1906.[f]					
April 20-30	3,185	2,060	2,635	1.68	.69
May	12,180	3,185	7,442	4.74	5.46
June	9,930	1,220	5,721	3.64	4.06
July	6,525	1,875	4,297	2.74	3.16
August	4,120	2,060	2,742	1.75	2.02
September	2,935	800	1,614	1.03	1.15
October	3,018	505	1,269	.808	.93
November	985	340	633	.403	.45

[a] River frozen January 1 to March 1 and December 28-31, 1902.
[b] More or less error is probably caused in the values of June to August, 1902, by great fluctuations of river stage. See description of station (p. 34)
[c] River frozen January 1 to February 2 and December 16-31, 1903.
[d] River frozen January 1 to April 9, and December 4-31, 1904.
[e] Ice conditions January 1 to March 26 and December 16-31, 1905.
[f] Ice conditions January 1 to April 19 and December 4-31, 1906.

KENNEBEC RIVER NEAR NORTH ANSON.

This station was established October 18, 1901, by N. C. Grover. It is located 1½ miles east of North Anson and about 1 mile above the mouth of Carrabassett River.

The channel is straight for 500 feet above and 1,000 feet below the station and has a width of about 350 feet, broken by one pier. The current is swift at high stages and moderately rapid at low stages, except near the left bank. The right bank is high and rocky. The left bank is comparatively low and subject to overflow at the time of highest water. The bed of the stream is rocky, with sand over a portion of the section, and is permanent.

Discharge measurements are made from the wooden highway bridge across the Kennebec, known locally as Patterson Bridge. The initial point for soundings is on the left bank, at the outside of the end post of the center truss of the bridge. Low-water measurements are made from a boat about 1,000 feet below the station at a section where there is a better distribution of current.

Numerous measurements under ice cover have been made at this station at a section about 500 feet below the bridge, and a rating curve has been constructed for such conditions. Further details of winter measurements at this point and of rating curve used are given in Water-Supply Paper No. 187.

Considerable fluctuations in the gage heights at this station occur from about May 1 to July 31, owing to the regulation of the flow at Indian Pond dam for log-driving purposes. These fluctuations are, however, less marked than those at The Forks. The daily discharge during this period for the years 1904 and 1905, as given below, is a mean of the discharges corresponding to gage heights of the high and low daily periods, each period being considered as lasting twelve hours.

All estimates previously published have been revised.

Gage readings are made twice each day by Mrs. C. S. Benjamin, the toll collector at the bridge. There are three gages—one, for ordinary stages, is a vertical rod fastened to the bridge pier; another, for high-water observations, is a vertical rod attached to the right abutment; the third, for low-water stages, is a standard chain gage attached to the wooden truss on the upstream side of the bridge. The length of the chain January 9, 1906, was 30.13 feet. The gage datum is 243.83 feet above mean sea level, as determined by the Kennebec River survey of 1904 and readjusted in 1906. The datum of the three gages is the same and is referred to bench marks as follows: (1) A copper bolt in a bowlder on the right bank, about 100 feet above the bridge, elevation 10.66 feet; (2) a marked point on the bottom chord of the bridge near the chain gage, elevation January 9, 1906, 24.81 feet.

Elevations refer to the datum of the gage. The bridge at bench mark 2, and hence the bench mark, has settled about 0.3 foot in eighteen months. The gage has been corrected several times by level during this period, however, and it is believed that no error of consequence in the gage readings has resulted.

The monthly means as given herewith for open-channel conditions for discharges greater than 1,600 and less than 10,000 second-feet are considered to be within 5 per cent of the true flow. Outside of these limits the error may be somewhat greater. Monthly means of flow under ice cover are considered to be correct within 10 per cent, except where unsatisfactory conditions are noted. Daily discharges are subject to much larger errors, particularly above gage height 8.0 feet and below 2.0 feet and during the log-driving period.

Discharge measurements of Kennebec River near North Anson.

Date.	Gage height.		Discharge.	Date.	Gage height.		Discharge.
	To water surface.	To bottom of ice.			To water surface.	To bottom of ice.	
1901.	*Feet.*	*Feet.*	*Sec.-ft.*	1904.	*Feet.*	*Feet.*	*Sec.-ft.*
October 14	3.20	....	3,120	June 10	6.00	....	8,560
October 18	3.00	....	2,460	July 26	2.94	....	2,400
				August 30	3.43	....	3,210
1902.							
July 29	4.55	....	6,220	1905.			
				February 9	5.27	3.27	2,080
1903.				February 9	5.32	3.32	2,140
March 28	6.50	....	11,400	April 19	4.26	....	5,000
May 27	3.25	....	3,130	July 20	3.72	....	3,770
June 15	6.80	....	11,100	October 27	2.30	....	1,320
June 16	4.90	....	6,740				
June 16	4.38	....	5,580	1906.			
July 17	3.25	....	2,960	January 9	3.58	2.38	1,290
August 15	3.78	....	4,000	January 10	3.40	2.22	1,120
September 24	2.85	....	2,500	January 10	3.56	2.38	1,180
November 6	2.00	....	1,200	March 2	4.26	2.43	1,590
				March 3	4.08	2.27	1,380
1904.				March 30	4.77	2.67	1,600
January 27	3.40	1.55	749	March 30	4.80	2.70	1,660
January 28	3.40	1.55	786	April 11	4.70	2.80	1,660
March 2	3.55	1.45	529	April 11	4.70	2.80	1,710
March 4	3.65	1.55	572	May 10	7.06	....	11,700

Daily gage height, in feet, of Kennebec River near North Anson.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1901.[a]				1901.			
1	....	3.0	4.9	17	....	2.7	....
2	....	3.0	5.0	18	....	2.7	....
3	....	2.85	5.3	19	....	2.7	....
4	....	3.1	....	20	2.45	2.7	....
5	....	3.0	....	21	2.3	2.7	....
6	....	2.9	....	22	2.25	2.85	....
7	....	2.7	....	23	2.2	2.75	....
8	....	2.5	....	24	2.55	2.5	....
9	....	2.55	....	25	2.85	2.7	....
10	....	2.55	....	26	2.8	2.7	....
11	....	2.35	....	27	2.7	2.8	....
12	....	2.5	....	28	2.7	4.55	....
13	....	2.55	....	29	2.7	5.15	....
14	....	2.85	....	30	2.75	5.0	....
15	....	2.75	....	31	2.9	....	....
16	....	2.75	....				

[a] River frozen November 28 to December 31, 1901.

Daily gage height, in feet, of Kennebec River near North Anson—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1902.[a]												
1	......	......	......	12.65	9.25	6.95	6.1	4.1	3.25	3.15	5.1	3.25
2	......	......	......	11.7	10.45	6.7	5.85	4.5	3.35	3.25	3.95	3.4
3	......	......	......	10.75	11.3	6.1	5.85	5.3	3.15	3.0	3.5	3.5
4	......	......	......	9.0	9.4	7.4	5.6	4.85	3.0	2.95	3.25	3.45
5	......	......	......	7.9	7.55	8.75	5.45	4.5	3.45	2.9	3.1	3.35
6	......	......	......	7.0	7.25	8.9	5.35	4.15	3.35	3.1	3.15	......
7	......	......	......	7.15	7.55	8.95	5.05	4.2	3.2	3.25	3.1	......
8	......	......	......	7.2	8.6	8.6	5.0	4.15	3.45	3.45	3.05	......
9	......	......	......	7.45	8.15	9.9	4.8	4.25	3.35	3.3	3.05	......
10	......	......	......	7.0	7.9	9.25	4.85	4.2	3.75	2.9	3.2	......
11	......	......	......	6.9	6.45	8.3	5.0	4.2	3.95	2.8	3.05	......
12	......	......	......	6.85	7.45	7.65	5.0	4.4	3.65	2.65	2.95	......
13	......	......	......	6.75	6.95	6.7	5.05	4.15	3.4	2.9	3.2	......
14	......	......	......	6.3	6.95	6.45	4.9	3.7	3.8	3.05	3.35	......
15	......	......	......	6.5	5.95	6.3	4.9	3.6	4.1	3.15	3.6	......
16	......	......	......	6.85	5.8	6.1	5.55	3.65	3.95	3.4	3.85	......
17	......	......	......	6.75	5.75	6.2	5.1	3.2	3.5	3.2	4.05	......
18	......	......	......	6.05	5.75	6.25	5.2	3.0	3.1	3.1	4.1	......
19	......	......	......	6.8	5.35	5.65	5.1	2.55	3.05	3.05	4.0	......
20	......	......	......	6.55	5.15	5.55	5.3	2.7	3.25	3.7	3.85	......
21	......	......	......	7.35	5.35	5.2	5.55	3.2	4.0	3.65	3.85	......
22	......	......	......	7.15	5.55	5.65	5.55	3.15	4.25	3.95	3.85	......
23	......	......	11.3	7.55	5.8	5.55	5.25	3.8	4.0	3.9	3.7	......
24	......	......	8.75	7.3	5.9	6.1	5.25	4.15	3.9	3.65	3.8	......
25	......	......	7.75	6.3	5.8	5.65	5.05	4.15	3.3	3.5	3.65	......
26	......	......	6.65	6.55	6.65	6.75	5.05	3.65	3.0	3.0	3.45	......
27	......	......	6.05	6.55	7.65	7.45	5.0	3.25	3.0	2.95	3.4	......
28	......	......	5.75	6.85	8.25	6.6	4.65	3.15	3.05	3.65	3.15	......
29	......	......	7.55	7.1	9.25	5.95	4.4	3.0	3.2	5.95	3.15	......
30	......	......	11.6	7.65	7.55	5.7	4.45	2.85	3.15	5.85	3.15	......
31	......	......	11.35	......	7.3	......	4.25	2.95	......	5.8	......	......
1903.[b]												
1	......	......	......	4.85	5.8	3.9	4.55	4.25	3.2	2.9	1.55	2.9
2	......	......	......	4.9	5.55	3.5	3.4	3.9	3.1	3.05	1.9	......
3	......	......	......	5.25	4.8	3.1	4.2	3.85	3.05	3.05	1.85	......
4	......	......	......	6.2	4.9	3.6	4.0	3.65	3.05	2.95	1.7	......
5	......	......	......	8.2	5.2	3.5	3.85	3.75	3.05	3.05	2.0	......
6	......	......	......	8.05	6.35	3.45	3.8	3.85	3.0	2.95	2.0	......
7	......	......	......	7.8	5.7	3.25	3.75	3.65	3.35	3.05	2.1	......
8	......	......	......	7.55	6.2	2.95	3.4	3.5	3.3	3.1	2.25	1.8
9	......	......	......	7.7	6.3	3.1	3.25	3.6	3.1	3.1	2.45	......
10	......	......	......	8.35	5.0	3.95	3.6	3.6	3.1	2.95	2.3	......
11	......	......	......	8.05	5.65	4.25	3.65	3.45	3.15	2.35	2.25	......
12	......	......	......	7.95	6.0	4.25	3.65	3.75	3.2	2.4	2.05	......
13	......	......	......	6.25	5.45	8.55	3.55	3.7	3.1	2.55	2.25	......
14	......	......	......	6.4	5.1	8.55	3.45	3.5	2.95	2.45	2.1	......
15	......	......	......	6.6	5.25	6.5	3.2	3.5	3.05	2.25	2.05	......
16	......	......	......	7.75	4.55	4.65	3.55	3.0	3.15	1.95	2.15	1.9
17	......	......	13.0	7.65	5.55	4.0	3.5	3.4	3.1	2.3	2.0	......
18	......	......	12.5	7.3	4.95	3.55	3.2	3.0	3.05	2.35	1.95	......
19	......	......	13.25	6.95	4.7	4.5	3.95	3.2	3.0	2.5	2.05	1.6
20	......	......	14.5	7.1	4.4	4.9	3.35	3.05	2.9	2.95	2.05	......
21	......	......	14.95	6.7	5.0	4.65	3.25	3.75	3.05	2.95	2.0	......
22	......	......	13.0	6.7	4.65	4.45	3.6	4.15	3.15	2.9	1.95	......
23	......	......	12.5	7.0	5.2	4.3	3.95	4.25	3.1	2.4	2.05	......
24	......	......	12.0	6.7	4.35	3.95	4.4	3.7	3.0	2.15	1.95	......
25	......	......	11.0	6.15	4.6	4.35	4.35	3.25	3.25	1.7	1.9	......
26	......	......	10.0	5.6	4.45	4.5	4.3	3.35	3.25	2.15	2.7	2.1
27	......	......	9.05	4.4	5.25	4.25	4.2	3.35	3.2	2.4	2.85	......
28	......	......	7.25	4.3	4.95	4.25	3.1	3.3	3.2	2.3	2.95	......
29	......	......	5.75	5.1	4.05	4.35	3.4	3.3	2.95	2.2	2.95	......
30	......	......	5.1	4.95	3.7	4.15	3.8	3.15	2.95	1.95	2.95	......
31	......	......	4.65	......	4.0	......	4.4	3.2	......	1.9	......	......

[a] River frozen January 1 to March 22, and December 6–31, 1902.
[b] River frozen January 1 to March 16 and December 2–31, 1903. Gage readings during the latter period are given to the bottom of the ice. Thickness of ice during December was estimated as follows: December 8, 0.5 foot; December 16, 1 foot; December 19, 1.3 feet; December 26, 1.4 feet.

Daily gage height, in feet, of Kennebec River near North Anson—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1904.[a]												
1				[b]2.8	9.65			5.0	3.4	5.7	3.05	[c]6.0
2	1.9		[d]1.4	2.9	8.65			4.5	3.4	5.05	2.95	
3				2.9	8.7			4.2	3.65	4.55	2.75	
4			[d]1.6	2.9	7.75			4.4	4.2	3.95	2.75	
5				2.9	7.25			4.7	4.65	3.8	2.75	
6		[e]1.6		3.0	7.4			4.8	4.25	3.4	2.8	[f]4.6
7				3.2	7.15			4.1	4.0	3.15	3.15	
8				3.5	6.05			4.5	3.8	3.0	3.45	
9	[g]1.7			3.8	6.7			3.6	3.6	2.95	3.35	
10				[h]6.85	9.1			3.45	3.45	2.95	3.15	
11				8.45				3.25	3.15	3.15	3.2	
12			[i]2.0	10.1				3.3	3.2	3.35	3.2	
13		[g]1.4		8.6				3.9	3.15	3.7	3.15	
14				6.8				3.5	3.15	3.8	3.3	
15				5.0				3.4	3.45	3.75	3.15	
16	[g]1.6			4.9				3.95	3.95	3.75	3.15	[j]3.4
17				4.4				4.9	3.9	3.9	3.15	
18				4.0				4.5	3.4	3.75	3.15	
19			[k]1.5	3.65				3.65	3.2	3.3	3.05	
20		[g]1.7		4.25				3.85	3.0	3.25	2.95	
21				4.1				4.2	2.9	3.2	3.0	
22				3.8				3.7	3.05	4.7	3.4	
23	[b]1.4			4.15				3.8	3.0	4.8	3.2	
24				4.8				3.0	3.05	4.55	3.25	[l]2.9
25				5.6				3.0	3.3	4.2	3.15	
26			[m]2.2	5.9				2.85	3.8	3.75	3.2	
27	[m]1.6	[g]1.9		6.0				2.95	3.8	4.15	3.2	
28	[m]1.6			6.15				3.25	3.8	4.2	3.55	
29				7.05				3.5	4.0	3.5	5.1	
30	[b]1.4			8.95				3.4	5.1	3.3	5.75	
31								3.4		3.2		[n]3.2
1905.[o]												
1				9.45				2.95	3.25	2.3	2.2	3.6
2				8.55				3.45	3.2	2.3	2.25	
3				8.95				4.15	2.95	2.3	2.15	
4		[p]3.3	[i]3.1	9.4				3.45	2.95	2.3	2.3	
5				8.4				3.3	3.1	2.3	2.2	
6				8.1				3.2	3.05	2.25	2.3	
7	[e]3.9			8.9				3.3	2.95	2.1	2.3	
8		[m]3.4		9.25				3.35	2.9	2.1	2.3	
9		3.3		8.5				3.4	2.75	2.1	2.3	[q]3.1
10				7.0				3.35	2.75	2.1	2.35	
11			[p]3.0	5.35				3.35	2.65	2.1	2.25	
12				5.5				3.3	2.55	2.1	2.2	
13				5.5				3.3	2.6	2.05	2.2	
14	[m]4.5			4.9				3.4	2.5	2.0	2.25	
15				5.05				3.45	2.55	2.0	2.2	

[a] During frozen season, 1904, gage readings are to the bottom of the ice.
[b] Ice 2 feet thick.
[c] River frozen over.
[d] Ice 2.5 feet thick.
[e] Ice 1.9 feet thick.
[f] Ice 0.35 foot thick.
[g] Ice 1.85 feet thick.
[h] River clear of ice.
[i] Ice 2.4 feet thick.
[j] Ice 0.6 foot thick.
[k] Ice 2.7 feet thick.
[l] Ice 0.9 foot thick.
[m] Ice 2.2 feet thick.
[n] Ice 1.8 feet thick
[o] River frozen January 1 to about March 27, 1905, when river was probably clear of ice. Also ice conditions December 1–31; the river being frozen with the exception of channels in each span, which were probably open during the whole month. Gage heights December 18, 22, and 28 probably affected by back water from anchor ice. During frozen period gage heights are to the bottom of the ice.
[p] Ice 2.3 feet thick.
[q] Ice 0.4 foot thick.

Daily gage height, in feet, of Kennebec River near North Anson—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1905.												
16	......	......	......	4.9	......	......	......	3.45	2.65	2.1	2.15	[a] 2.8
17	......	......	......	4.65	......	......	......	3.35	2.4	2.05	2.4	......
18	......	[b] 3.0	[c] 2.4	4.5	......	......	......	3.55	2.7	2.1	2.8	[d] 2.7
19	......	......	......	4.3	......	......	......	3.5	2.75	1.95	2.1	......
20	......	......	......	4.3	......	......	......	3.4	2.75	1.9	1.95	......
21	[e] 3.6	......	......	4.35	......	......	......	3.2	2.85	1.9	2.1	......
22	......	......	......	4.95	......	......	......	3.05	2.8	1.9	2.0	[d] 4.9
23	......	......	......	4.65	......	......	......	3.05	2.7	2.0	2.0	......
24	......	......	......	4 7	......	......	......	2.95	2.6	1.95	2.1	......
25	......	[b] 3.2	[f] 2.8	4 75	......	......	......	2.95	2.5	2.0	2.1	......
26	......	......	......	4 4	......	......	......	3.15	2.35	2.05	2.15	......
27	......	......	6.8	4 95	......	......	......	2.7	2.35	2.25	2.3	......
28	[e] 3 4	......	6.9	4 7	......	......	......	2.4	2.3	2.2	2.45	[g] 4.7
29	......	......	7.9	4 9	......	......	......	2.7	2.3	2.25	2.7	......
30	......	......	8.45	4 95	......	......	......	3.35	2.3	2.3	2.95	......
31	......	......	8.95	......	......	......	......	3.2	......	2.2	......	......
1906.[h]												
1	2.5	......	......	......	6.3	5.9	4.45	3.75	4.05	2.9	3.5	2.7
2	......	......	2.4	......	7.1	5.85	4.65	3.8	3.95	2.85	3.3	4.3
3	......	2.3	2.3	2.4	7.75	6.8	4.85	3.7	3.8	2.75	3.1	......
4	......	......	......	......	8.25	5.1	4.7	3.8	3.85	2.7	3.35	......
5	......	......	......	......	7.4	5.0	4.55	3.7	3.75	2.65	3.4	4.2
6	......	......	......	......	8.0	5.25	4.3	3.4	3.65	2.7	3.3	4.15
7	......	......	......	2.7	7.5	6.75	4.55	3.35	3.65	2.8	3.1	4.05
8	2.5	......	2.2	......	6.8	7.45	4.7	3.3	3.6	2.85	3.1	4.0
9	2.4	......	......	......	6.4	7.1	4.75	3.3	3.6	2.85	3.1	3.8
10	2.2	2.2	......	......	7.25	6.2	4.5	4.0	3.6	4.8	3.25	......
11	......	......	......	2.8	9.2	6.15	3.8	3.6	3.55	4.85	3.2	......
12	......	......	......	......	7.7	5.75	5.05	3.55	3.3	4.6	3.25	3.6
13	......	......	2.2	......	6.75	5.15	5.05	3.6	3.5	3.9	3.35	......
14	2.5	......	......	2.8	6.8	5.15	4.9	3.55	3.45	3.45	3.05	......
15	......	......	......	......	7.0	4.75	4.6	3.8	3.3	3.05	2.95	......
16	......	......	......	......	6.5	5.0	4.25	3.8	3.2	3.0	2.75	3.1
17	2.5	2.1	2.3	......	6.8	4.35	4.0	3.7	3.2	2.7	2.75	......
18	......	......	......	10.0	7.7	4.45	4.25	3.65	3.2	2.85	2.4	......
19	......	......	......	9.5	8.05	4.5	4.15	3.6	3.2	2.85	2.55	......
20	1.9	......	2.0	8.05	7.35	4.85	4.2	3.55	3.2	2.95	2.8	......
21	......	......	......	6.85	7.55	4.35	4.15	3.55	3.1	3.45	3.05	......
22	......	......	......	7.2	7.35	4.4	4.5	3.5	3.0	3.65	3.2	......
23	......	......	......	7.85	6.35	4.4	4.65	3.5	2.85	3.7	3.2	3.3
24	......	2.5	2.2	7.2	6.9	4.75	4.65	3.5	3.0	4.0	3.15	......
25	......	......	......	6.15	6.2	3.6	5.05	3.7	2.95	4.15	3.0	......
26	......	......	......	5.85	6.5	3.75	4.6	3.5	2.9	5.25	2.9	......
27	3.9	......	2.2	4.5	6.05	4.95	4.5	3.7	2.85	5.1	2.9	......
28	......	......	......	5.25	7.8	4.95	3.75	4.05	2.85	4.75	2.75	......
29	......	......	2.6	5.35	6.95	4.65	3.65	4.3	2.85	4.45	2.6	......
30	......	......	2.7	5.55	7.35	4.65	3.5	4.3	2.8	4.1	2.65	3.2
31	......	......	......	......	6.95	......	3.7	4.1	......	3.6	......	......

[a] Ice 0.6 foot thick.
[b] Ice 2.4 feet thick.
[c] Ice 2.7 feet thick.
[d] Ice 0.7 foot thick.
[e] Ice 2.3 feet thick.
[f] Ice 2.5 feet thick.
[g] Ice 1 foot thick.

NOTE.—An error in gage heights June 17 to December 31, 1906, was discovered after the manuscript for this paper was sent to the printer. Gage heights as published above for this period are 0.35 foot too high. The monthly discharge, however, as given on p. 48, has been corrected and gives the true flow of the river.

[h] River frozen January 1 to April 17, 1906; clear of ice the evening of April 18; frozen over December 2–31, 1906. Backwater due to anchor ice during December. Gage readings during the frozen season, 1906, are to the bottom of the ice. The thickness of ice was measured as follows:

Date.	Thickness.	Date.	Thickness.	Date.	Thickness.
1906.	*Feet.*	1906.	*Feet.*	1906.	*Feet.*
January 1	0.9	February 17	1.9	December 6	0.6
January 8	1.0	February 24	1.8	December 7	.7
January 9	1.3	March 2, 4, 8, 13	2.0	December 8	.8
January 10	1.4	March 17, 20	2.1	December 9	1.0
January 14	1.1	March 24, 27, 29, 30	2.3	December 12	1.2
January 17	1.1	April 3, 7	2.1	December 16	1.4
January 20	1.2	April 11	2.0	December 23	1.4
Jauuary 27	1.3	April 14	1.9	December 30	1.5
February 3, 10	1.5	December 5	.4		

Rating tables for Kennebec River near North Anson.

OCTOBER 20, 1901, TO DECEMBER 31, 1903.[a]

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	680	3.10	2,785	4.80	6,535	9.00	16,200
1.50	760	3.20	2,960	4.90	6,790	8.20	16,950
1.60	840	3.30	3,140	5.00	7,050	8.40	17,710
1.70	930	3.40	3,330	5.20	7,570	8.60	18,500
1.80	1,020	3.50	3,520	5.40	8,090	8.80	19,300
1.90	1,110	3.60	3,720	5.60	8,630	9.00	20,100
2.00	1,205	3.70	3,925	5.80	9,170	9.50	22,100
2.10	1,310	3.80	4,140	6.00	9,730	10.00	24,200
2.20	1,430	3.90	4,360	6.20	10,300	10.50	26,400
2.30	1,500	4.00	4,590	6.40	10,880	11.00	28,700
2.40	1,700	4.10	4,825	6.60	11,480	11.50	31,000
2.50	1,840	4.20	5,060	6.80	12,090	12.00	33,300
2.60	1,990	4.30	5,300	7.00	12,720	12.50	35,700
2.70	2,140	4.40	5,545	7.20	13,370	13.00	38,100
2.80	2,290	4.50	5,790	7.40	14,050	14.00	43,100
2.90	2,450	4.60	6,035	7.60	14,750	15.00	48,300
3.00	2,615	4.70	6,285	7.80	15,470		

JANUARY 1, 1904, TO DECEMBER 31, 1906.[b]

1.90	990	3.50	3,355	5.10	7,053	7.40	13,880
2.00	1,080	3.60	3,551	5.20	7,316	7.60	14,580
2.10	1,182	3.70	3,752	5.30	7,587	7.80	15,300
2.20	1,294	3.80	3,958	5.40	7,858	8.00	16,030
2.30	1,415	3.90	4,169	5.50	8,136	8.20	16,780
2.40	1,544	4.00	4,385	5.60	8,415	8.40	17,540
2.50	1,680	4.10	4,606	5.70	8,700	8.60	18,330
2.60	1,822	4.20	4,832	5.80	8,984	8.80	19,130
2.70	1,970	4.30	5,062	5.90	9,274	9.00	19,930
2.80	2,124	4.40	5,297	6.00	9,565	9.50	21,930
2.90	2,284	4.50	5,536	6.20	10,130	10.00	24,030
3.00	2,450	4.60	5,779	6.40	10,710	10.50	26,230
3.10	2,621	4.70	6,026	6.60	11,310	11.00	28,530
3.20	2,797	4.80	6,277	6.80	11,920		
3.30	2,978	4.90	6,532	7.00	12,550		
3.40	3,164	5.00	6,790	7.20	13,200		

DISCHARGE UNDER ICE COVER FROM 1904 TO 1906.[c]

1.40	510	2.30	1,255	3.20	2,075	4.10	2,970
1.50	590	2.40	1,340	3.30	2,170	4.20	3,080
1.60	670	2.50	1,430	3.40	2,265	4.30	3,190
1.70	750	2.60	1,520	3.50	2,360	4.40	3,300
1.80	830	2.70	1,610	3.60	2,460	4.50	3,420
1.90	915	2.80	1,700	3.70	2,560	4.60	3,540
2.00	1,000	2.90	1,790	3.80	2,660		
2.10	1,085	3.00	1,885	3.90	2,760		
2.20	1,170	3.10	1,980	4.00	2,860		

[a] This table is applicable only for open-channel conditions. It is based on 12 discharge measurements made during 1901–1903. It is well defined between gage heights 2.0 feet and 5.0 feet.

[b] This table is applicable only for open-channel conditions. It is based on 6 discharge measurements made during 1904–1905 and the form of the 1903 curve. It is well defined between gage heights 2.3 feet and 5.0 feet.

[c] This table is applicable only for ice cover conditions. It is based on 13 discharge measurements made during 1904–1906. It is well defined between gage heights 1.5 feet and 3.4 feet. Gage heights are to the bottom of the ice.

Daily discharge, in second-feet, of Kennebec River near North Anson.

	May.	June.	July.		May.	June.	July.
1904.				1905.			
1	....	9,560	5,330	1	9,340	6,560	6,540
2	....	9,560	5,980	2	7,720	6,170	6,010
3	....	7,480	6,760	3	7,590	6,210	8,870
4	....	7,480	6,460	4	9,420	5,620	9,080
5	....	8,740	5,840	5	9,870	6,700	8,510
6	....	9,770	5,380	6	9,270	6,780	6,390
7	....	13,920	5,240	7	10,010	6,870	7,810
8	....	12,470	4,940	8	7,590	6,950	4,650
9	....	10,640	4,860	9	10,720	5,230	5,300
10	....	11,360	4,540	10	12,020	5,390	7,900
11	17,960	10,950	4,540	11	9,010	6,250	7,190
12	27,190	9,130	6,980	12	9,470	6,310	7,060
13	17,380	8,440	8,480	13	8,870	7,470	6,200
14	12,550	7,810	7,830	14	8,160	8,930	5,860
15	9,870	7,110	7,220	15	7,200	9,240	5,820
16	23,770	7,090	7,260	16	9,370	8,090	5,360
17	24,030	6,400	6,430	17	8,110	7,680	4,270
18	16,610	5,640	6,400	18	8,050	6,920	4,060
19	13,720	5,700	6,430	19	7,050	7,350	4,390
20	13,720	5,820	4,200	20	6,940	8,230	5,140
21	10,600	6,870	4,580	21	8,070	8,440	5,140
22	11,930	5,980	2,540	22	8,470	9,370	5,380
23	10,720	6,600	2,540	23	8,480	8,590	5,150
24	9,270	5,110	3,170	24	8,580	5,910	5,020
25	8,310	4,790	3,530	25	9,280	5,560	3,990
26	9,270	5,200	2,890	26	9,310	6,490	3,990
27	9,130	5,470	3,760	27	8,870	7,800	3,830
28	8,030	5,610	4,970	28	8,740	7,300	2,940
29	10,160	5,280	4,360	29	8,470	6,640	3,120
30	10,440	5,100	4,540	30	7,870	6,250	2,620
31	9,270	....	4,590	31	7,420	....	2,380

Monthly discharge of Kennebec River near North Anson.

[Drainage area, 2,790 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1901.[a]					
October 20-31	2,450	1,430	1,993	0.714	0.32
November 1-27	2,785	1,630	2,190	.785	.79
1902.[b]					
March 23-31	31,460	9,035	19,040	6.82	2.28
April	36,420	9,870	14,760	5.29	5.90
May	30,080	7,440	13,960	5.00	5.76
June	23,780	7,570	12,800	4.59	5.12
July	10,010	5,180	7,439	2.67	3.08
August	7,830	1,915	4,188	1.50	1.73
September	5,180	2,615	3,494	1.25	1.39
October	9,590	2,065	3,661	1.31	1.51
November	7,310	2,532	3,623	1.30	1.45
December 1-5	3,520	3,050	3,312	1.19	.22
1903.[c]					
March 17-31	48,040	6,160	28,220	10.11	5.64
April	17,520	5,300	11,800	4.23	4.72
May	10,740	3,925	7,315	2.62	3.02
June	18,300	2,532	5,760	2.06	2.30
July	5,912	2,785	4,040	1.45	1.67
August	5,180	2,615	3,646	1.31	1.51
September	3,235	2,450	2,791	1.00	1.12
October	2,785	930	1,966	.705	.81
November	2,532	800	1,450	.520	.58
December[d]	1,790	670	1,010	.362	.42

[a] River frozen November 28 to December 31, 1901.
[b] River frozen January 1 to March 22; ice conditions December 6-31, 1902.
[c] River frozen January 1 to March 16 and December 2-31, 1903.
[d] Rating table for ice cover used.

Monthly discharge of Kennebec River near North Anson—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1904. [a]					
January	915	510	690	0.247	0.28
February	915	510	680	.244	.26
March	1,700	510	920	.330	.38
April	24,470	1,790	7,440	2.67	2.98
May	27,190	8,030	14,220	5.10	5.88
June	13,920	4,790	7,703	2.76	3.08
July	8,480	2,540	5,244	1.88	2.17
August	6,790	2,204	4,094	1.46	1.68
September	7,053	2,284	3,598	1.29	1.44
October	8,700	2,367	4,058	1.45	1.67
November	8,842	2,047	3,030	1.09	1.22
December	5,500	1,790	2,750	.986	1.14
The year	27,190	510	4,536	1.63	22.18
1905. [b]					
January	3,420	2,075	2,660	.953	1.10
February	2,265	1,885	2,070	.742	.77
March	19,730	1,340	4,110	1.47	1.69
April	21,730	5,062	10,420	3.74	4.17
May	12,020	6,940	8,688	3.12	3.60
June	9,370	5,230	7,043	2.52	2.81
July	9,080	2,380	5,483	1.97	2.27
August	4,719	1,544	2,906	1.04	1.20
September	2,887	1,415	1,991	.713	.80
October	1,415	990	1,205	.432	.50
November	2,367	1,035	1,349	.484	.54
December [c]	3,950	1,430	2,540	.910	1.05
The year	21,730	990	4,205	1.51	20.50
1906. [d]					
January	2,760	915	1,680	.602	.69
February	1,430	1,085	1,240	.445	.46
March	1,610	1,000	1,220	.437	.50
April	24,030	1,340	7,120	2.55	2.84
May	20,730	9,700	13,250	4.75	5.48
June	14,060	2,887	7,100	2.54	2.83
July	6,026	2,709	4,584	1.64	1.80
August	4,277	2,367	3,057	1.09	1.26
September	3,752	1,612	2,455	.880	.98
October	6,532	1,415	2,982	1.07	1.23
November	2,709	1,131	1,966	.704	.78
December	2,810	1,479	2,032	.728	.84
The year	24,030	915	4,057	1.45	19.80

[a] River frozen January 1 to April 9 and December 1–31, 1904; rating table for ice cover used.
[b] River frozen January 1 to March 27 and December 1–31, 1905; rating table for ice cover used.
[c] Values for the last half of December, 1905, are probably too large, owing to backwater caused by anchor ice.
[d] River frozen January 1 to April 18 and December 2–31, 1906; rating table for ice cover used. Values given for December, 1906, are probably too high, owing to anchor ice; rating table for ice cover applied December 2–31, 1906.

KENNEBEC RIVER AT WATERVILLE.

Observations of the flow of Kennebec River at Waterville have been made by the Hollingsworth & Whitney Company since 1892, and furnish the longest set of continuous records of flow of this river. This company manufactures manila paper and ground-wood and sulphite pulp.

The dam is of timber cribwork, the main portion having a vertical downstream face with a horizontal crest about 5.75 feet wide and an upstream slope of about 40° from the horizontal. The average elevation of the crest of the dam, as determined by levels during July, 1906, was 119.37 feet above the Hollingsworth & Whitney datum, or

71.53 feet above mean sea level, according to the Kennebec datum as corrected by levels of 1906. The total length of the dam is 800 feet, which includes a width of log way of 34 feet. Flashboards are kept on the dam the greater part of the time, their average elevation in July, 1906, being 123.73 feet above the Hollingsworth & Whitney datum, or 75.89 feet above mean sea level. The crest of the dam is in fairly good condition. The leakage has never been measured, but is assumed arbitrarily as 100 second-feet. The water which flows in the canals is used through 46 wheels, most of which have been rated at Holyoke under practically the same head, the average head at Waterville being about 23 feet. Some water is lost through the canal, through small waste gates, and over wasteweirs. A small amount, estimated at 100 second-feet, is used for washing and mill purposes.

Methods and diagrams for estimating the flow through the wheels and over the dam were developed by the late Sumner Hollingsworth, engineer for the company. Observations were made at 12 o'clock noon of each day, that hour having been chosen after investigation as a time when the flow is least affected by storage of dams upstream and as giving most nearly the average for the day. When the flow of the river is less than about 3,500 second-feet all of the water is used through the wheels.

The values of flow at this point are probably in error from 10 to 15 per cent, on account of the manner in which the flow has been computed and the uncertainty of the constants used. During the four or five years preceding January 1, 1906, computations are in error from 10 to 15 per cent where the flow has been computed with flashboards, owing to the assumption that the top of the boards was at elevation 124.0 feet above the Hollingsworth & Whitney datum, the results as published being too small.

These records are now being furnished by the Hollingsworth & Whitney Company through the courtesy of their engineer, James L. Dean.

Daily discharge, in second-feet, of Kennebec River at Waterville.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1892.[a]												
1				3,530		11,840	17,355					
2				4,730	7,920		20,030					
3				10,260		11,840						
4				19,100	6,310		29,985					
5				25,250								
6				22,980	8,950	11,515						
7				28,150								
8				24,830		8,200						
9				22,810	9,660							
10						7,925						

[a] November figures are for 1891. The closing of gates at Moosehead Lake is said to have caused the small discharge here recorded.

Daily discharge, in second-feet, of Kennebec River at Waterville—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1892.												
11	......	......	......	18,090	5,900	......	......	......	......	......	......	......
12	......	......	......	......	......	......	......	......	......	......	......	......
13	......	......	......	11,195	7,650	7,375	......	......	......	......	......	......
14	......	......	......	......	......	......	......	......	......	......	a 545	......
15	......	......	......	8,660	......	7,100	......	......	......	......	a 395	......
16	......	......	......	......	......	......	......	......	......	......	a 670	......
17	......	......	......	......	6,940	8,490	......	......	......	......	a 639	......
18	......	......	......	6,940	6,580	......	......	......	......	......	a 568	......
19	......	......	......	......	......	......	......	......	......	......	a 961	......
20	......	......	......	6,465	5,310	10,260	......	......	......	......	a1,449	......
21	......	......	......	......	......	......	......	......	......	......	a1,488	......
22	......	......	2,470	7,530	......	17,355	......	......	......	......	a1,112	......
23	......	......	......	9,835	7,215	......	......	......	......	......	......	......
24	......	......	2,430	......	......	19,640	......	......	......	......	a 958	......
25	......	......	2,250	......	13,750	21,615	......	......	......	......	a1,399	......
26	......	......	2,220	......	......	......	......	......	......	......	a2,296	......
27	......	......	2,000	13,160	10,750	19,250	......	......	......	......	......	......
28	......	......	2,325	......	......	19,640	......	......	......	......	......	......
29	......	......	2,390	8,780	......	29,990	......	......	......	......	......	......
30	......	......	2,730	......	12,160	20,030	......	......	......	......	......	......
31	......	......	3,080	......	......	......	......	......	......	......	......	......
1893.												
1	......	2,350	2,500	4,100	21,700	13,200	10,840	1,940	2,490	......	1,980	2,780
2	......	2,250	2,500	4,250	21,200	16,250	......	2,330	2,140	1,980	1,980	2,580
3	......	2,200	2,450	4,500	27,600	15,200	9,990	2,380	......	1,980	1,980	......
4	......	2,100	2,400	4,400	24,700	......	11,230	2,360	1,890	1,710	1,980	......
5	......	2,100	2,400	3,700	60,500	13,800	8,840	2,290	1,890	1,980	......	1,440
6	......	2,200	2,400	3,700	46,500	15,250	9,740	......	1,890	1,980	1,980	1,440
7	......	2,300	2,350	3,600	36,700	16,250	8,410	2,240	2,260	1,980	2,250	1,440
8	......	2,250	2,350	3,600	30,200	18,200	8,410	2,210	2,360	......	1,980	1,440
9	......	2,100	2,325	6,400	26,300	23,500	......	2,360	2,680	1,980	1,980	1,440
10	......	3,000	2,300	9,200	25,200	15,900	8,260	2,360	......	1,980	1,980	......
11	......	2,400	2,300	12,400	27,000	......	8,710	2,290	2,160	1,710	1,980	1,440
12	2,000	2,550	2,300	15,000	31,700	16,250	6,510	2,290	2,380	1,440	......	1,440
13	2,100	2,600	5,400	16,500	31,300	23,200	6,410	......	2,190	1,780	1,980	1,440
14	2,300	2,550	8,000	16,500	54,500	20,500	6,040	2,240	2,410	1,980	1,980	1,440
15	2,500	2,500	11,300	18,200	43,100	18,200	5,540	2,290	2,340	4,000	1,980	1,440
16	2,600	2,400	7,400	16,500	34,100	15,200	......	2,430	2,175	3,050	1,980	1,440
17	4,800	2,300	6,300	14,100	30,700	13,200	4,840	2,210	......	2,550	1,980	......
18	5,000	2,200	6,100	14,000	83,500	13,200	4,490	2,150	1,710	2,550	2,250	1,710
19	4,200	2,100	5,700	14,100	46,100	11,200	3,660	2,290	1,710	1,980	......	1,710
20	3,200	2,200	5,600	16,300	34,500	11,000	3,270	......	2,200	2,250	2,250	1,440
21	2,100	2,350	4,600	14,500	......	12,000	3,590	2,240	1,710	1,980	2,520	1,440
22	1,900	2,450	3,900	12,300	24,300	14,480	3,490	2,205	1,710	......	2,250	1,440
23	2,100	2,350	3,600	13,800	22,800	13,640	......	2,180	1,710	1,980	2,550	1,440
24	2,200	2,200	3,600	15,800	21,200	11,840	3,170	2,153	......	1,980	2,480	......
25	2,300	2,400	4,000	14,500	19,800	......	2,830	2,295	1,710	3,380	1,980	......
26	2,200	2,400	4,400	14,600	17,000	14,270	2,440	2,390	1,710	2,450	......	1,440
27	2,200	2,450	4,400	14,200	16,300	14,000	2,380	......	1,980	1,980	1,980	1,590
28	2,300	2,500	4,300	14,600	15,200	15,100	2,360	2,340	1,980	3,630	2,080	1,440
29	2,300	......	4,200	14,800	14,550	14,600	2,240	2,310	1,710	3,530	3,980	1,590
30	2,350	......	4,100	19,800	13,600	13,500	......	2,230	1,980	3,280	3,630	1,590
31	2,400	......	4,000	......	13,900	......	2,440	2,430	......	2,280	......	......
1894.												
1	1,470	1,910	1,740	......	15,650	11,190	......	3,305	2,253	2,181	3,896	1,570
2	1,640	1,910	1,740	4,496	14,510	12,930	7,030	3,240	1,125	1,923	7,295	......
3	1,640	1,740	1,740	4,496	14,090	......	6,860	3,143	2,312	1,915	5,619	2,187
4	1,640	......	......	4,370	13,220	12,930	......	3,218	1,871	1,930	10,512	2,194
5	1,640	1,910	2,010	4,370	13,220	10,400	10,020	......	2,207	1,896	9,486	2,213
6	1,640	1,910	1,740	5,473	......	9,070	8,570	3,087	1,824	1,655	7,381	1,869
7	......	1,740	1,910	4,720	12,280	9,070	7,665	3,019	2,209	......	5,606	2,193
8	1,640	1,740	2,370	......	10,100	8,520	......	3,019	2,185	1,897	4,651	2,128
9	1,470	1,740	3,040	5,278	8,550	6,910	7,055	3,285	1,140	1,913	3,937	1,245
10	1,640	1,740	4,643	5,655	7,226	......	6,336	3,045	2,293	1,913	3,739	1,937
11	1,640	......	......	5,950	7,050	5,900	6,674	3,050	2,034	5,553	3,040	1,211
12	1,470	1,740	5,390	6,980	6,110	......	6,674	......	2,818	6,738	3,636	1,694
13	1,640	1,740	5,390	7,170	......	6,280	6,674	3,250	2,280	5,017	3,476	1,819
14	......	1,740	6,220	6,980	5,840	5,900	6,336	3,125	2,309	8,387	2,782	2,386
15	1,470	1,740	5,580	......	6,820	6,010	......	3,005	2,341	9,036	2,500	2,600

a November figures are for 1891. The closing of gates at Moosehead Lake is said to have caused the small discharge here recorded.

Daily discharge, in second-feet, of Kennebec River at Waterville—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1894.												
16	1,640	1,740	4,460	12,150	7,410	5,900	6,674	3,010	....	3,829	2,661	2,275
17	1,640	1,740	4,855	13,310	9,935	....	6,046	3,110	2,183	7,527	2,489	2,513
18	1,470	....	....	20,640	9,935	....	5,765	3,060	2,136	6,418	2,152	2,466
19	1,640	1,740	4,140	21,760	10,915	5,520	5,100	....	1,883	5,088	2,631	2,331
20	1,640	1,740	5,405	22,910	....	9,565	5,550	3,230	1,885	4,253	1,984	2,326
21	....	1,760	3,802	26,860	13,540	10,055	4,885	3,050	12,102	3,231	2,446	2,205
22	1,640	1,760	6,660	....	8,250	5,490	....	2,915	6,659	3,730	2,502	2,208
23	1,640	1,810	6,395	35,280	6,100	6,265	3,680	2,825	4,673	3,576	2,495	1,229
24	1,640	1,810	5,215	33,680	6,360	....	3,565	3,070	4,143	3,315	2,487	1,912
25	1,910	....	....	29,130	6,580	3,930	3,670	2,555	2,646	2,549	2,786	......
26	1,910	1,760	4,855	25,210	10,560	3,781	3,830	....	2,571	2,605	2,484	......
27	1,910	1,740	4,184	21,980	....	3,710	3,830	2,855	2,509	2,854	2,461	1,831
28	....	1,740	4,180	20,680	8,690	10,480	3,830	2,494	2,378	....	2,515	1,770
29	1,640	....	3,895	....	7,480	8,985	....	2,615	1,918	2,859	1,444	1,657
30	1,640	....	3,620	17,450	7,960	8,070	3,415	2,294	467	2,458	1,645	904
31	1,640	....	3,510	....	10,000	....	3,345	2,400	....	2,452	....	1,227
1895.												
1	1,135	2,214	1,685	2,176	13,227	9,818	5,042	3,153	1,792	1,106	1,081	5,904
2	1,599	2,208	1,687	2,205	11,967	9,314	4,315	3,062	2,867	1,149	1,347	4,682
3	1,655	1,733	1,252	2,406	11,461	8,408	4,278	3,063	2,560	1,130	1,870	8,378
4	1,664	2,174	1,720	2,638	12,172	7,979	3,784	1,576	2,226	1,110	1,421	5,842
5	1,608	2,444	2,229	6,164	11,934	7,364	4,062	3,015	2,212	1,152	2,201	3,519
6	1,780	2,077	2,145	7,691	12,584	7,370	3,844	2,738	2,200	....	1,946	2,723
7	1,678	1,854	1,956	9,286	12,764	7,425	4,429	2,610	2,155	1,128	1,708	3,273
8	1,947	1,718	1,951	9,325	10,917	7,623	4,499	2,816	1,438	1,104	1,657	2,301
9	1,894	1,622	1,949	24,407	12,074	6,166	4,039	2,580	2,250	1,126	1,426	3,393
10	1,896	1,397	1,368	54,192	7,848	6,418	4,072	2,382	2,502	1,356	5,125	3,089
11	1,889	1,983	1,683	27,999	9,630	5,852	3,993	1,529	2,256	1,109	9,595	3,105
12	1,864	1,946	1,920	20,858	7,920	6,454	3,934	2,690	2,209	1,121	8,351	2,598
13	1,273	1,943	1,932	19,304	11,352	4,854	3,731	2,435	1,996	....	6,279	2,278
14	2,403	1,967	1,946	24,061	16,175	5,887	3,658	2,405	1,970	1,185	3,882	2,524
15	2,441	1,648	2,236	86,201	12,878	6,925	3,767	2,160	1,150	1,141	3,869	1,747
16	2,481	1,950	2,224	70,381	12,121	6,592	3,631	2,433	1,736	1,134	4,972	2,545
17	2,490	579	1,566	43,408	9,842	6,156	3,508	2,118	1,710	1,250	6,455	2,069
18	2,509	2,112	2,224	34,708	7,895	6,121	3,546	857	1,987	1,546	5,695	2,621
19	2,439	1,708	2,194	31,068	8,668	5,616	3,512	2,681	1,721	1,587	4,591	1,928
20	1,817	1,689	1,937	31,562	7,807	5,905	3,232	2,072	1,741	....	4,169	2,180
21	2,439	1,361	1,965	31,363	5,863	5,641	3,257	2,357	1,707	1,353	10,949	2,536
22	2,304	1,656	1,946	29,572	5,449	4,497	2,617	2,240	1,050	1,422	11,179	3,321
23	2,332	1,606	1,977	28,511	5,515	5,075	3,151	2,199	1,139	1,428	6,694	11,026
24	2,290	....	1,627	23,707	8,261	5,046	2,875	2,722	1,387	1,432	5,124	9,147
25	2,333	1,629	2,241	20,348	8,037	5,670	2,863	1,658	1,167	1,372	5,632	6,136
26	2,319	1,676	2,314	18,931	6,919	6,216	2,590	4,284	1,155	1,399	4,804	5,162
27	1,706	1,714	2,769	15,489	7,533	6,290	2,552	5,089	1,104	....	9,383	5,792
28	2,433	1,927	2,600	15,929	8,119	5,708	2,096	4,890	1,145	1,115	15,900	26,673
29	2,198	....	2,418	10,853	6,109	5,690	2,671	3,450	....	1,355	11,623	16,148
30	2,439	....	2,459	13,216	4,868	4,955	2,930	3,080	1,115	1,385	9,372	14,590
31	2,127	....	1,898	....	8,982	....	2,678	3,102	....	1,081	....	19,713
1896.												
1	3,281	2,643	6,257	5,527	29,468	7,491	4,811	3,730	2,643	2,870	3,238	8,049
2	21,881	1,292	111,246	5,861	26,601	11.004	4,374	2,696	2,611	2,975	4,259	6,844
3	17,367	2,717	52,691	6,647	25,207	6,846	4,236	3,595	1,772	3,734	4.023	5,730
4	11,482	2,522	24,810	6,442	18,064	5.891	5,578	3,597	2,577	2,275	3,757	2,200
5	6,708	2,243	13,866	5,782	26,583	5,318	5.249	3,037	2,371	5,249	3,435	2,603
6	4,153	2,236	13,170	5,709	30,879	4,961	11,678	3,044	2,129	4,567	29,865	2,545
7	3,803	2,857	11,862	5,373	29,499	4,343	11,214	3,313	6,903	3,954	23,836	3,312
8	4,329	4,634	10,323	4,998	25,090	4,391	9,685	3,468	7,978	3,277	17,040	2,851
9	2,970	3,962	8,950	5,040	22,228	4,374	8,690	....	6,094	3,210	13,322	2,870
10	2,971	3,452	9,499	5,199	19,997	5,953	7,149	4,113	4,624	3,166	12,152	2,852
11	3,006	3,140	5,469	6,757	20,249	3,855	6,047	4,737	4,003	2,394	10,028	2,851
12	2,755	3,002	5,226	8,356	21,463	6,252	4,637	4,276	3,668	2,626	11,389	2,938
13	2,970	2,816	6,109	16,221	19,072	5,235	4,844	3,906	1,857	2,617	11,777	2,385
14	2,689	2,967	3,651	11,472	18,994	5,142	4,437	3,695	2,952	2,363	10,962	2,981
15	2,595	2.879	....	15,989	18,066	4,679	4,289	3,414	3,002	2,388	9,319	2,874
16	2,990	2,193	3,888	46,946	16,696	4,944	4,449	2,566	2,789	2,311	8,426	2,307
17	2,513	2,829	10,129	64,700	17,981	4,549	5,121	3,197	2,336	2,384	7,947	2,272
18	2,736	2,824	3,159	61,270	14,846	4,536	5,125	3,137	2,932	2,016	7,952	1,489
19	1,568	2,758	4,087	57,188	15,227	4,219	4,495	3,178	3,590	2,319	8,130	2,303
20	2,782	2,763	6,699	52,131	13,163	4,710	4,596	3,079	1,733	2,326	7,547	1,870

Daily discharge, in second-feet, of Kennebec River at Waterville—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1896.												
21	3,000	2,781	12,922	74,469	14,782	5,352	4,391	2,858	4,313	2,352	6,572	2,547
22	2,767	2,771	3,239	60,021	13,215	6,073	4,419	2,747	4,207	4,208	5,222	2,287
23	2,793	2,162	10,025	41,711	3,976	6,655	4,374	2,759	4,147	8,956	3,749	2,047
24	2,542	3,854	7,820	46,693	23,517	6,275	4,258	2,943	3,754	7,804	4,606	1,768
25	2,394	2,812	6,608	40,793	14,220	6,334	4,386	2,990	2,924	7,986	6,185	1,579
26	1,881	2,790	6,637	36,126	4,482	5,817	3,794	2,851	2,969	6,227	6,322	1,506
27	2,499	2,772	7,253	32,729	5,729	5,459	4,215	2,571	2,474	5,388	5,683	1,497
28	2,765	2,558	10,886	30,217	5,117	5,309	3,781	2,410	3,149	2,644	6,169	2,317
29	2,531	2,794	5,945	30,517	4,867	4,200	3,728	2,416	3,148	3,214	8,424	2,063
30	2,473	......	6,901	30,977	3,192	5,307	3,335	1,625	2,777	2,888	8,432	1,845
31	2,220	......	5,006	....	6,092	....	3,831	2,531	......	2,891	......	1,787
1897.												
1	2,073	3,587	2,007	6,334	39,001	18,204	8,719	12,975	4,771	2,314	2,911	4,630
2	2,085	3,485	2,950	7,648	34,299	16,780	9,885	13,656	4,357	2,048	2,637	3,825
3	1,650	3,775	2,423	9,075	32,654	17,526	9,531	11,263	4,340	967	6,687	3,754
4	2,318	3,598	2,629	9,635	34,210	17,542	8,512	9,206	3,701	2,532	9,442	3,190
5	3,732	3,348	2,586	11,536	40,730	17,549	7,147	7,796	3,090	2,490	8,628	3,063
6	18,504	3,223	2,522	12,889	36,362	15,756	8,189	7,226	3,865	2,375	7,729	5,968
7	10,210	4,185	4,026	18,329	26,923	16,023	7,410	5,889	3,571	2,158	6,457	6,382
8	5,860	4,305	2,703	21,149	26,610	15,785	7,922	5,761	4,008	1,533	6,443	5,229
9	5,028	5,634	2,285	18,268	24,400	13,801	7,967	4,000	3,973	2,097	5,195	5,172
10	3,793	6,225	2,291	15,458	23,995	12,961	7,270	5,243	3,997	2,100	7,927	4,879
11	3,293	5,933	4,554	16,671	41,196	16,003	6,290	5,849	4,808	2,109	8,133	4,212
12	3,601	5,007	4,230	14,377	41,223	14,962	5,761	7,562	9,689	1,508	7,313	4,048
13	3,084	4,629	5,238	13,999	23,965	13,819	7,256	9,771	5,463	1,788	6,350	5,765
14	2,542	3,897	5,045	14,796	41,284	15,304	45,507	7,112	4,915	6,070	2,789	6,104
15	2,881	4,070	5,387	16,881	38,988	16,003	55,634	6,601	4,864	6,323	4,902	7,153
16	2,715	4,028	4,925	24,426	32,431	14,617	33,770	5,368	4,325	5,528	4,420	13,621
17	2,187	3,848	2,533	34,813	27,453	14,638	26,160	7,776	4,333	3,837	5,913	14,005
18	2,942	3,163	2,025	28,642	23,788	13,344	21,286	11,566	3,239	3,262	7,191	11,381
19	1,918	2,467	2,304	31,734	21,013	11,200	17,067	8,562	3,632	3,287	6,428	7,665
20	2,211	2,480	2,339	32,799	18,843	11,390	12,542	6,755	3,488	2,322	4,391	5,835
21	2,283	3,543	3,167	26,949	17,562	10,649	7,747	7,129	5,043	2,331	4,161	6,799
22	2,222	2,636	2,083	24,087	15,105	7,399	5,218	7,907	8,422	2,326	3,009	5,419
23	2,951	2,427	2,621	24,008	15,448	9,991	8,408	6,616	7,438	2,051	2,703	3,861
24	2,300	2,302	5,547	29,875	14,809	9,095	8,980	5,718	5,838	1,510	2,181	3,839
25	1,953	2,544	5,832	33,605	10,818	8,353	8,925	5,816	4,481	2,140	2,687	3,225
26	1,847	2,877	6,345	42,860	16,539	8,751	10,826	6,280	3,841	2,348	1,889	2,541
27	2,727	2,825	5,992	51,255	21,779	7,590	9,842	6,220	4,555	2,415	6,097	2,563
28	2,252	3,705	5,311	66,907	24,568	7,691	7,950	5,706	4,084	2,973	13,399	2,685
29	2,477	......	4,994	58,745	26,000	8,023	6,734	5,382	2,915	2,008	6,883	3,001
30	4,024	......	5,071	43,797	22,697	8,345	6,405	5,154	2,801	2,344	6,171	2,733
31	3,534	......	5,513	....	20,526	....	11,707	4,364	......	2,600	......	2,699
1898.												
1	2,475	2,539	4,170	20,385	36,048	14,341	4,385	3,790	2,477	2,691	6,382	3,752
2	2,284	2,955	4,188	16,556	39,372	13,776	4,343	2,707	2,489	2,862	5,182	3,740
3	2,222	2,687	5,648	13,871	38,301	10,900	3,440	2,887	2,453	2,180	4,691	3,667
4	2,715	3,090	5,163	12,143	37,358	8,791	3,490	2,833	1,437	1,831	4,115	1,747
5	2,771	2,775	2,997	10,830	37,730	9,846	4,343	2,809	2,510	1,865	3,467	3,336
6	3,431	3,068	4,094	10,150	37,569	10,301	4,272	3,712	2,392	2,119	3,231	3,227
7	1,807	3,475	5,070	7,080	31,580	9,189	4,477	3,252	3,093	1,570	3,880	3,221
8	4,826	2,994	5,033	6,563	29,880	9,098	4,203	4,374	3,073	1,269	3,675	3,262
9	5,434	3,744	4,767	7,472	28,753	12,541	5,464	4,218	3,018	1,150	4,133	2,995
10	4,492	3,154	4,623	10,457	25,636	14,318	1,745	4,017	3,042	961	3,351	2,635
11	3,025	3,829	5,329	15,299	22,059	12,086	4,111	3,048	3,050	1,585	5,332	1,792
12	3,286	3,317	6,752	19,848	21,899	11,322	4,484	3,413	3,057	1,731	5,856	3,268
13	3,240	3,680	8,397	44,854	24,042	11,003	4,267	2,927	2,505	1,585	4,896	2,235
14	3,287	3,912	9,880	47,141	34,332	10,777	3,776	1,130	1,913	1,288	3,332	1,873
15	4,909	4,026	11,534	50,381	32,988	12,514	4,327	3,443	1,480	1,299	3,465	1,888
16	3,717	4,042	12,816	49,415	27,500	11,295	3,994	2,499	1,560	3,665	3,264	1,883
17	3,891	3,764	12,215	47,112	24,756	10,584	3,611	2,560	1,530	6,031	3,490	2,160
18	3,453	3,221	11,918	47,321	23,440	9,478	3,896	2,491	1,570	5,055	3,698	1,723
19	3,460	3,267	12,484	44,700	23,153	9,196	3,938	2,622	1,607	4,454	5,018	2,315
20	3,505	2,885	13,218	39,327	20,592	11,129	3,747	2,526	1,876	3,264	8,798	2,447
21	3,893	3,172	14,580	36,671	19,088	10,855	3,835	913	2,223	2,872	8,935	2,560
22	4,614	3,764	17,177	33,789	18,570	9,950	5,038	3,425	1,851	2,690	8,046	2,274
23	2,542	2,133	16,615	30,792	17,073	8,334	3,871	2,866	1,888	6,036	7,184	2,778
24	2,321	3,437	15,987	34,352	15,277	9,483	3,418	3,425	1,916	6,318	6,007	3,013
25	2,866	4,352	17,812	52,119	15,993	8,864	3,747	2,849	3,689	4,924	7,811	2,489

Daily discharge, in second-feet, of Kennebec River at Waterville—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1898.												
26	2,032	3,933	17,029	45,520	15,589	7,508	3,879	4,432	5,443	4,288	7,923	2,471
27	3,136	3,653	16,560	38,083	15,639	5,267	3,385	4,218	4,788	6,514	10,037	2,761
28	2,905	4,387	18,928	37,354	14,611	4,326	4,189	3,940	3,581	15,319	3,672	2,464
29	2,727	......	19,762	33,652	16,632	5,689	3,444	3,396	3,778	11,127	2,758	2,499
30	1,738	......	17,711	31,767	16,962	6,715	3,204	3,555	3,247	9,229	3,723	2,076
31	2,607	......	27,432	......	16,298	......	2,832	2,857	......	7,672	......	2,178
1899.												
1	2,529	2,458	3,382	6,411	41,756	13,044	6,115	4,809	1,623	......	1,390	1,456
2	2,202	2,198	3,047	6,214	39,665	12,790	5,024	3,594	2,010	1,443	2,819	1,441
3	2,274	2,187	3,333	6,160	36,589	10,647	5,363	4,442	567	1,665	4,093	747
4	2,159	2,163	3,324	6,017	36,942	11,673	3,178	4,199	1,612	1,415	4,109	2,913
5	2,452	1,580	1,960	6,207	30,922	12,264	5,258	4,498	2,070	1,969	2,995	3,567
6	2,451	2,505	3,331	6,227	30,531	11,123	5,120	4,415	2,082	1,449	3,327	3,196
7	2,449	2,173	3,563	6,433	30,125	10,563	5,076	5,064	2,070	1,476	3,106	2,015
8	1,739	2,071	3,516	7,007	29,447	12,748	5,367	5,195	......	......	2,637	2,070
9	2,757	2,057	3,502	7,541	26,888	12,517	3,936	4,388	2,352	1,215	2,338	1,737
10	2,513	2,152	3,428	9,001	24,803	12,506	5,142	4,128	246	940	2,119	......
11	2,400	2,141	3,357	9,650	22,132	10,738	5,123	4,101	2,635	774	1,698	1,393
12	2,386	2,244	2,302	9,405	20,229	10,278	4,866	3,954	2,067	1,784	......	1,160
13	2,404	2,348	3,353	11,181	18,697	6,039	5,100	2,699	2,340	1,968	1,488	2,022
14	2,436	1,964	3,423	19,700	19,643	7,030	5,950	3,964	2,370	1,391	1,970	5,223
15	1,678	1,844	3,624	23,106	14,886	6,739	5,078	3,538	2,257	492	2,017	4,410
16	2,731	2,392	3,773	38,826	15,099	7,557	4,043	3,213	1,261	1,378	2,053	4,621
17	2,439	2,434	3,501	30,532	17,307	5,913	4,866	3,007	1,298	1,667	1,823	1,861
18	2,631	2,727	3,253	30,312	15,073	6,807	5,232	3,321	1,416	1,366	1,739	2,695
19	2,434	2,198	1,960	37,096	15,071	7,290	4,948	2,643	2,005	1,096	......	2,027
20	2,629	2,915	3,320	41,565	15,684	6,483	4,880	1,242	2,362	1,377	1,718	2,611
21	2,440	2,734	3,080	34,540	16,262	7,101	5,499	2,748	2,006	1,120	2,317	1,878
22	2,094	2,744	2,778	30,286	18,287	7,317	6,367	3,377	2,351	......	1,748	2,340
23	2,709	2,451	2,711	39,550	17,271	7,319	5,688	2,956	2,348	1,408	2,085	2,617
24	2,154	2,745	2,837	45,724	15,900	7,516	6,509	2,534	1,073	1,334	2,035	2,068
25	2,435	2,929	2,770	41,739	15,925	5,673	5,837	2,180	2,031	1,104	2,028	......
26	2,450	1,420	2,030	43,139	11,480	7,301	5,916	2,158	1,761	995	......	......
27	2,454	3,039	2,786	45,795	12,567	7,315	5,502	1,089	1,466	1,149	1,413	2,323
28	2,434	3,362	2,740	39,943	12,303	6,880	5,649	2,288	2,046	1,121	1,743	2,330
29	1,245	......	2,998	41,584	13,064	7,038	4,170	2,203	1,951	406	1,744	1,821
30	2,513	......	3,962	39,300	13,035	6,445	2,500	2,065	2,091	1,104	......	1,474
31	2,453	......	6,820	......	12,823	......	4,087	2,354	......	1,086	......	......
1900.												
1	1,463	7,117	15,468	8,792	22,830	12,115	4,849	4,910	4,238	2,859	2,307	6,540
2	1,565	3,696	13,353	8,381	27,905	12,782	8,232	5,149	1,635	3,337	2,357	4,394
3	1,604	3,628	9,656	9,338	28,823	15,730	7,520	5,525	3,191	3,134	2,293	6,146
4	1,653	......	11,445	14,047	52,268	25,091	2,763	5,601	3,180	2,876	1,502	5,968
5	1,193	3,166	6,544	15,927	48,843	19,591	6,715	4,431	2,905	2,565	1,660	4,640
6	1,452	3,159	6,240	15,544	39,585	16,103	6,255	5,357	2,913	2,168	2,260	4,583
7	1,304	3,188	9,323	19,353	34,551	14,088	6,271	4,708	2,865	859	1,604	4,506
8	2,324	3,303	4,913	27,072	28,889	12,792	4,799	4,597	2,908	3,457	1,630	4,701
9	2,060	2,925	4,947	24,219	23,561	10,930	6,465	4,573	2,276	3,715	3,819	3,548
10	1,998	3,114	4,927	19,765	28,628	10,495	6,501	4,758	2,330	3,715	17,580	4,498
11	1,751	1,615	4,373	17,053	25,277	10,083	5,767	4,462	2,871	4,051	11,521	2,978
12	1,711	2,933	4,950	20,560	22,411	10,148	4,984	2,627	2,865	4,106	13,301	3,504
13	1,009	12,148	4,932	25,463	20,804	9,661	12,281	4,651	2,560	4,003	10,314	3,851
14	696	15,696	4,799	27,373	18,378	10,168	9,601	4,716	2,851	......	8,564	4,078
15	1,712	21,761	5,051	26,429	22,307	7,707	6,262	4,450	2,826	2,590	5,839	4,101
16	1,996	19,766	10,516	31,224	29,793	9,141	7,018	4,750	2,426	3,993	4,877	3,080
17	1,755	15,073	7,479	32,034	29,945	7,256	5,112	4,834	3,130	3,993	3,706	3,958
18	1,748	11,998	12,670	35,155	31,845	7,808	6,017	4,624	3,147	4,190	6,533	4,068
19	2,064	5,871	20,538	42,557	40,265	7,308	5,652	3,075	2,776	3,989	5,079	3,505
20	1,792	7,090	12,562	60,541	48,460	5,866	6,057	4,547	2,602	3,720	5,215	3,809
21	656	6,978	12,448	62,291	44,162	6,402	5,678	4,072	3,044	2,392	8,107	3,799
22	2,060	6,123	12,412	55,863	35,060	6,651	4,386	3,203	2,776	3,164	6,360	4,109
23	4,045	5,308	11,361	51,180	25,403	6,613	5,253	4,029	......	3,185	12,471	1,895
24	3,748	4,117	10,742	44,066	23,333	5,015	4,923	3,649	3,137	2,621	8,620	3,880
25	3,697	18,833	9,792	39,913	21,682	6,669	4,737	......	2,887	2,902	7,886	3,196
26	3,684	13,387	9,460	33,353	18,907	5,066	5,403	1,016	2,563	2,624	7,000	4,311
27	3,609	23 971	8,925	27,800	17,467	5,803	4,857	3,169	2,575	2,373	7,320	4,498
28	3,007	18,375	8,604	23,905	15,469	7,679	4,872	3,501	2,568	1,520	9,693	4,299
29	6,851	......	8,391	21,793	19,171	7,189	2,344	3,629	3,169	2,902	5,214	4,035
30	4,311	......	8,410	14,688	16,301	9,043	4,231	3,147	2,197	2,623	6,660	2,468
31	5,399	......	8,498	......	14,113	......	3,725	3,454	......	2,338	......	4,050

Daily discharge, in second-feet, of Kennebec River at Waterville—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1901.												
1	3,740	2,990	2,050	11,600	29,600	5,140	9,080	6,480	1,470	2,770	3,710	170
2	3,530	2,920	2,270	15,260	30,570	6,540	8,350	5,270	4,760	2,160	3,080	2,580
3	3,240	2,180	1,620	19,580	29,620	8,700	8,330	4,810	4,270	1,590	480	2,630
4	2,990	2,690	2,840	25,040	28,080	12,930	4,020	2,410	3,910	2,140	3,020	2,310
5	2,420	2,680	4,080	54,490	23,350	11,380	7,940	3,890	3,640	2,730	3,630	2,540
6	1,880	2,670	4,290	57,960	21,380	9,990	7,330	3,170	3,630	960	3,090	2,410
7	3,100	2,700	4,350	42,370	13,300	9,110	5,110	3,290	3,040	3,090	3,370	1,990
8	3,280	3,000	4,220	76,410	11,800	9,930	5,130	5,820	1,140	2,460	2,810	230
9	3,220	2,420	4,130	76,590	13,290	15,250	6,020	6,180	2,870	2,740	2,530	2,480
10	3,040	2,000	2,870	60,700	12,340	13,900	5,770	5,640	3,120	2,390	560	2,470
11	3,240	2,680	4,090	53,410	16,330	10,000	5,750	3,240	2,790	2,470	2,620	3,080
12	3,240	2,690	4,010	39,290	22,880	10,120	5,450	5,640	3,070	2,380	2,210	4,060
13	2,780	2,690	3,970	35,610	23,110	7,830	5,440	5,920	3,650	670	2,220	4,220
14	3,230	2,660	4,060	33,250	21,770	7,830	3,310	5,410	3,700	3,050	2,930	4,220
15	2,940	2,340	3,390	31,460	18,120	7,470	4,860	5,010	1,700	6,430	1,640	10,300
16	3,430	2,350	3,410	30,220	14,230	5,660	4,600	3,840	3,370	6,680	2,270	151,000
17	3,530	2,000	3,080	29,300	14,210	7,840	4,450	5,640	3,090	5,060	1,260	46,750
18	3,960	2,900	3,700	28,820	12,110	6,640	4,400	4,630	2,830	4,360	2,830	29,730
19	4,040	2,640	3,440	29,150	10,450	7,170	4,450	4,700	1,910	4,230	2,530	19,870
20	2,840	2,650	3,110	27,600	14,560	6,630	4,840	4,060	2,800	1,870	2,570	11,770
21	3,250	2,670	3,640	28,540	11,930	6,290	4,010	3,900	2,560	2,810	2,590	6,380
22	3,490	2,380	4,180	45,590	7,560	6,420	4,220	3,650	750	2,830	2,330	5,230
23	3,500	2,390	5,050	65,770	9,860	5,620	3,940	3,120	3,160	2,340	2,270	3,980
24	3,520	1,430	700	65,970	7,600	6,960	3,480	3,800	3,190	2,920	1,470	6,480
25	3,230	2,140	8,510	49,700	7,590	6,020	3,400	3,530	2,800	2,960	2,810	8,110
26	3,260	2,320	8,500	44,710	6,620	6,880	3,720	4,100	2,810	3,720	2,200	7,520
27	2,380	2,530	12,890	42,510	9,090	6,970	3,810	3,900	2,420	1,280	2,330	7,100
28	2,990	1,990	10,530	39,950	8,260	7,050	2,810	2,880	2,380	3,100	2,090	6,360
29	3,260	....	13,340	38,280	9,060	6,980	4,510	1,890	790	2,840	2,260	3,740
30	2,950	....	8,440	34,780	5,140	7,800	4,520	1,840	3,010	2,790	2,430	4,600
31	2,970	....	4,120	....	6,420	....	5,740	1,850	....	2,850	....	4,920
1902.												
1	4,610	4,020	11,790	47,870	34,410	15,370	12,200	4,990	3,190	4,090	8,020	4,100
2	4,280	2,670	23,180	37,920	28,840	15,350	12,670	5,370	4,120	4,120	5,980	4,080
3	3,960	4,100	35,110	36,530	28,890	13,050	13,200	4,630	4,060	4,110	5,670	4,090
4	3,150	3,840	54,340	29,290	26,340	12,500	10,310	9,010	3,280	4,080	4,830	4,070
5	900	3,850	38,650	25,220	19,740	17,860	10,990	7,480	3,740	2,020	3,760	3,390
6	3,460	3,980	30,250	19,460	17,210	19,750	9,890	6,490	4,090	3,510	4,130	4,070
7	3,730	4,010	25,920	21,340	17,860	19,140	10,470	5,320	1,580	4,170	4,220	1,020
8	3,490	4,010	22,280	21,260	24,290	16,830	9,850	5,130	3,500	5,550	4,080	3,710
9	2,960	2,850	20,240	20,020	20,720	26,140	8,880	5,240	4,040	4,160	3,040	3,190
10	3,260	3,990	17,740	24,790	17,520	24,550	8,910	4,420	4,000	4,160	4,120	3,580
11	3,760	3,970	20,940	23,370	15,730	20,390	9,510	5,090	7,540	3,770	4,090	2,900
12	2,240	3,910	13,160	23,470	13,030	16,510	9,410	5,730	5,850	1,750	4,100	4,090
13	3,840	3,910	14,230	21,340	13,490	14,760	7,260	5,850	5,390	3,510	4,020	3,990
14	3,410	3,940	17,590	21,290	13,600	13,040	5,440	5,180	3,430	3,780	4,180	2,350
15	2,890	3,950	18,940	16,970	10,480	11,700	6,940	3,860	7,570	3,730	4,380	3,990
16	3,210	2,100	18,860	18,730	10,530	11,210	7,340	3,980	5,860	4,060	4,550	3,970
17	3,180	3,950	27,940	17,540	9,720	11,340	7,200	1,890	5,180	4,120	5,450	6,930
18	3,160	3,370	46,630	16,940	8,410	11,590	6,920	3,740	4,140	4,080	5,420	5,150
19	1,790	3,930	22,400	17,500	5,560	10,670	6,940	3,440	4,100	2,060	5,040	5,480
20	3,550	3,660	27,320	17,880	8,420	10,550	5,740	2,640	4,100	4,200	4,920	4,900
21	2,870	3,440	46,570	18,740	9,640	9,710	6,780	2,300	2,410	4,980	4,680	3,420
22	2,860	3,660	45,320	21,250	8,950	8,400	7,010	3,320	4,730	4,510	4,380	4,710
23	7,810	3,150	46,670	24,030	12,320	13,100	6,940	5,950	4,530	4,560	4,470	6,220
24	10,510	4,080	36,990	21,290	8,990	10,620	6,460	12,670	4,180	4,200	4,600	6,900
25	6,360	4,100	27,490	17,640	13,030	10,160	6,230	8,250	3,990	4,130	4,160	5,460
26	4,620	4,840	22,900	13,910	13,560	10,200	4,870	6,590	3,820	2,730	4,300	5,160
27	4,070	4,420	18,720	13,430	21,690	33,940	4,500	4,030	4,020	3,950	3,450	5,150
28	3,870	4,700	13,920	18,620	23,800	21,870	5,100	4,130	2,060	7,830	4,200	4,660
29	3,880	....	20,670	19,500	29,210	15,370	5,170	4,150	3,950	24,980	4,140	5,000
30	3,910	....	57,970	18,600	19,250	12,130	4,950	4,040	4,100	15,170	3,130	4,540
31	3,940	....	47,070	....	17,820	....	4,950	1,860	....	10,830	....	4,450

Daily discharge, in second-feet, of Kennebec River at Waterville—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	6,577	4,129	6,706	15,606	9,173	4,593	5,636	5,608	3,349	2,573	158	1,269
2	4,811	4,486	8,468	16,465	12,725	4,282	5,813	3,777	3,299	2,271	1,272	1,270
3	4,046	4,038	8,320	13,543	7,250	4,761	5,215	5,065	3,002	2,278	2,141	1,253
4	2,551	4,231	7,646	16,153	8,308	4,758	4,640	4,888	3,124	1,002	1,480	1,849
5	4,347	4,003	7,107	23,548	6,610	4,351	2,773	4,530	1,995	1,996	1,773	1,203
6	4,361	4,050	6,480	21,937	6,946	4.312	5,338	4,337	527	2,110	1,527	100
7	4,012	3,971	6,069	21,610	7,895	2,397	5,088	4,066	2,920	2,524	1,460	1,260
8	3,988	3,925	6,640	21,752	7,546	4,345	5,134	3,999	3,174	2,309	119	335
9	3,992	4,004	8,115	23,374	9,507	4,354	4,678	1,120	3,476	2,590	1,467	1,351
10	3,907	3,741	13,273	22,595	8,024	4,547	4,923	4,358	3,106	2,158	2,293	1,237
11	2,061	3,985	18,755	23,662	8,685	4,918	4,831	4,044	3,086	100	1,957	1,238
12	3,684	4,088	31,283	21,245	8,546	4,337	2,547	3,755	2,814	2,029	1,965	1,238
13	4,020	4,408	27,438	18,734	8,733	6,466	5,358	4,268	712	2,021	1,547	100
14	3,443	4,356	24,487	15,036	7,355	30,050	5,123	4,887	3,420	2,018	1,552	915
15	3,627	3,841	24,518	16,390	8,306	17,999	4,809	4,529	2,901	143	960	1,226
16	3,764	2,003	21,560	17,298	8,313	10,219	4,758	712	2,915	1,464	1,483	925
17	4,032	4,042	18,188	19,328	5,705	5,286	5,587	4,885	3,245	1,141	1,957	200
18	3,336	4,025	17,496	17,921	8,129	5,373	4,849	3,947	3,697	100	2,283	893
19	4,070	4,028	17,645	16,768	7,940	5,172	2,445	3,444	3,176	1,522	2,845	207
20	3,739	4,013	35,732	16,175	7,962	5,079	4,978	3,446	353	3,126	2,774	100
21	3,717	3,952	33,641	15,219	7,253	5,438	4,721	3,874	1,531	3,984	1,419	1,289
22	3,998	2,370	31,793	15,577	7,870	7,930	4,939	5,624	3,190	2,555	118	2,678
23	4,413	3,754	31,650	15,689	5,362	7,194	5,385	3,701	2,612	2,542	1,979	3,825
24	4,756	3,696	34,315	15,111	4,765	6,698	9,018	4,010	1,700	2,604	1,972	3,206
25	4,245	3,957	34,353	13,498	5,614	6,900	7,483	4,384	2,545	118	1,432	2,727
26	4,210	3,936	30,089	11,783	7,866	5,490	6,405	3,915	1,975	2,747	863	2,480
27	4,121	3,639	25,326	5,919	5,952	6,416	6,554	3,606	115	1,913	1,330	2,510
28	4,199	3,980	21,480	5,531	5,928	5,654	5,001	3,857	2,881	2,022	680	1,292
29	4,014	....	19,344	8,221	5,162	5,864	5,056	3,340	2,285	1,524	115	1,755
30	4,028	....	11,029	8,274	3,363	5,556	4,895	672	1,964	2,567	1,127	1,335
31	4,268	....	12,314	....	2,098	....	8,052	3,482	....	1,534	....	1,808
1904.												
1	1,313	953	1,018	8,733	34,770	7,532	6,131	5,080	3,514	10,460	4,148	2,903
2	975	918	1,047	7,980	33,910	10,490	5,980	5,168	3,692	7,968	3,908	2,891
3	1,381	917	1,044	6,770	23,890	10,220	4,872	4,086	3,415	6,806	3,649	3,462
4	714	944	1,132	7,211	22,060	8,675	4,140	4,983	3,602	5,960	3,521	1,545
5	896	1,248	1,370	6,777	20,730	10,310	7,370	4,923	5,534	4,183	3,516	3,150
6	552	940	100	8,349	21,970	10,610	6,174	4,508	5,921	4,064	2,689	2,894
7	959	543	659	9,541	18,370	12,740	5,585	3,843	5,458	4,305	3,494	2,783
8	956	940	2,063	15,620	13,390	14,460	5,428	4,817	5,170	3,875	3,486	2,764
9	1,545	629	2,616	23,240	12,810	11,250	5,628	4,378	3,597	3,959	3,573	2,859
10	100	654	2,982	33,340	25,760	13,250	3,423	3,943	4,050	4,045	3,793	2,895
11	830	1,891	3,552	33,530	30,910	12,000	5,442	4,556	2,610	3,828	3,223	100
12	1,218	615	3,291	27,600	37,840	11,190	5,590	4,970	3,779	4,116	3,764	3,183
13	916	713	3,033	25,080	26,850	7,402	7,049	6,273	3,779	4,027	2,659	2,302
14	1,909	100	3,254	14,620	19,610	6,051	8,263	5,247	3,176	4,284	4,096	2,459
15	1,163	645	3,232	12,310	15,510	5,919	6,969	5,687	3,777	4,159	3,512	2,587
16	1,543	1,389	2,799	10,590	28,760	5,801	6,989	5,326	6,978	3,144	4,071	2,323
17	100	538	2,736	8,813	37,560	5,552	3,694	5,087	5,822	4,350	4,365	2,596
18	912	1,432	2,513	8,343	27,440	6,388	5,512	5,419	4,531	4,464	2,875	1,249
19	1,577	578	2,097	7,947	20,680	4,670	5,774	4,918	4,030	4,121	2,898	3,163
20	905	1,393	1,413	8,414	24,520	6,458	4,346	4,261	4,055	4,062	2,678	3,178
21	1,764	100	2,426	10,530	20,910	6,401	4,969	4,380	2,961	3,322	3,755	2,771
22	900	1,031	2,497	10,460	17,880	6,324	4,692	6,720	3,767	5,179	4,078	3,423
23	910	908	3,078	11,110	15,150	5,979	2,941	5,280	4,004	6,866	4,053	2,775
24	303	1,329	3,372	11,740	14,530	5,834	3,987	4,537	3,722	5,722	658	2,899
25	1,012	987	4,064	15,180	13,970	5,579	4,998	3,913	2,691	4,214	4,105	1,966
26	995	1,295	10,470	16,320	13,010	5,110	4,805	4,112	4,082	4,146	4,015	2,074
27	1,642	1,420	11,080	17,810	11,120	7,848	4,699	3,535	4,042	4,816	2,407	3,127
28	638	100	11,380	15,930	11,200	7,251	4,933	2,950	4,381	4,516	3,465	2,833
29	634	651	10,400	20,910	8,277	11,860	5,619	4,256	4,251	3,964	2,962	2,474
30	629	....	8,449	36,110	9,031	5,423	5,523	4,152	8,111	2,768	2,353	3,048
31	348	....	8,189	....	9,774	....	4,550	4,534	....	4,139	....	2,764

Daily discharge, in second-feet, of Kennebec River at Waterville—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1905.												
1	2,116	3,366	2,645	32,125	10,058	6,501	5,275	5,114	3,077	2,390	2,113	2,809
2	2,256	3,125	2,532	22,278	13,593	7,755	5,040	4,108	2,466	2,205	2,252	2,524
3	3,421	3,422	2,366	16,278	8,680	6,597	5,450	4,401	100	2,433	1,965	1,485
4	2,847	2,868	2,521	14,471	7,113	6,102	8,591	4,018	3,363	2,086	1,952	2,814
5	2,737	2,123	714	10,854	12,907	8,371	7,554	3,496	3,912	1,852	100	3,932
6	2,545	3,225	2,815	11,303	18,324	7,113	6,363	2,030	4,603	1,598	1,960	3,085
7	2,872	2,956	2,202	25,578	11,542	7,480	5,962	3,962	4,350	2,143	2,867	3,133
8	2,094	2,569	2,431	19,498	10,545	5,123	5,422	2,940	4,015	100	2,830	2,784
9	3,699	2,556	2,257	15,715	10,425	6,815	3,434	3,133	3,904	1,813	3,067	2,835
10	3,912	2,484	2,555	12,342	10,923	6,026	4,937	3,397	2,348	2,089	3,113	1,202
11	3,659	2,553	2,541	12,394	11,251	6,119	4,836	2,810	3,596	2,229	2,843	2,499
12	4,182	1,859	2,278	15,260	9,696	6,780	5,024	3,048	3,071	1,879	1,825	2,197
13	3,915	3,158	2,855	15,780	8,440	7,333	5,015	100	3,055	1,875	3,059	1,639
14	3,623	2,475	2,530	29,954	9,109	9,251	4,948	3,909	2,813	1,681	2,514	1,735
15	2,317	2,538	2,273	11,928	9,559	8,493	4,864	3,036	2,990	141	2,810	1,786
16	3,642	2,548	2,208	14,340	8,699	7,386	5,803	3,310	2,998	2,478	1,957	1,520
17	3,108	2,570	2,245	11,456	10,196	6,071	5,025	3,345	1,828	2,428	2,011	1,166
18	3,425	2,546	2,247	12,690	11,441	5,548	4,298	3,832	2,466	2,432	2,840	1,308
19	3,103	1,842	1,553	7,065	14,315	5,881	4,676	2,819	3,616	2,351	1,838	1,327
20	3,099	3,033	2,561	6,291	14,279	6,678	5,002	2,642	4,286	1,817	2,840	1,690
21	3,324	2,547	2,615	7,486	9,711	6,108	5,301	3,653	2,936	1,836	2,243	1,713
22	2,296	2,541	2,849	10,164	8,788	7,433	3,969	3,344	3,663	100	2,390	2,221
23	3,654	2,545	3,384	12,934	10,174	6,678	2,814	3,372	3,937	1,118	1,913	1,748
24	2,766	2,529	3,447	11,205	11,269	6,325	3,997	2,998	1,370	1,555	1,983	914
25	2,825	2,811	3,701	7,878	8,403	5,109	3,648	2,922	3,636	2,397	1,450	2,050
26	2,849	1,200	3,349	8,294	11,298	6,017	3,372	2,955	3,169	1,903	1,216	1,930
27	3,145	3,119	13,250	7,081	10,583	6,633	3,828	1,528	2,802	1,687	3,452	1,996
28	3,430	2,520	15,245	8,881	10,120	6,739	3,308	3,635	2,503	1,936	2,843	2,025
29	1,831	....	20,950	8,901	8,241	6,672	3.473	3,087	2 206	100	2,547	2,620
30	3,700	....	21,365	6,603	8,153	5,845	1,491	3,054	142	1,645	2,378	2,062
31	3,150	....	26,230	....	8,202	....	3,986	3,161	....	2,484	....	1,212
1906.												
1	2,450	3,792	2,310	4,223	20,350	16,920	7,574	5,240	3,035	1,184	3,863	2,634
2	2,339	3,591	2,553	4,470	24,520	14,430	7,288	4,753	3,041	1,794	3,541	1,075
3	2,694	3,187	2,530	4,055	25,210	15,800	7,829	4,552	4,089	2,105	2,702	2,430
4	1,992	1,528	1,244	3,965	26,380	16,380	6,500	4,286	3,667	1,842	2,711	2,214
5	1,981	2,668	2,368	4,340	25,630	14,770	7,557	3,457	3,699	1,790	3,858	1,899
6	1,809	2,624	2,595	6,743	24,980	14,920	7,768	4,630	3,719	1,810	3,278	1,928
7	633	2,016	2,039	7,897	23,770	21,450	7,626	4,219	2,654	873	2,673	1,450
8	2,908	2,006	2,776	6,924	23,100	20,350	7,133	3,657	3,419	1,836	2,662	1,413
9	2,297	1,778	2,018	7,259	20,390	21,030	7,384	3,884	1,812	1,869	2,989	1,854
10	1,346	1,663	1,623	7,296	22,770	18,150	6,939	3,884	3,481	2,154	3,032	2,713
11	1,571	1,228	1,214	6,021	34,370	18,510	7,605	4,186	3,306	9,178	2,118	2,654
12	2,112	1,747	2,550	5,835	27,760	15,520	7,412	2,159	2,999	7,152	3,804	2,727
13	1,932	2,051	2,849	6,311	20,590	19,130	8,801	3,377	1,850	5,317	3,613	2,623
14	902	2,528	2,006	6,977	22,380	14,710	8,122	3,326	3,848	5,645	3,809	2,732
15	1,612	2,068	2,244	17,180	22,020	12,920	7,218	2,993	2,939	3,873	3,272	2,703
16	2,214	2,024	1,795	39,390	18,650	11,260	6,267	3,036	1,195	2,710	3,587	2,700
17	1,643	2,029	1,714	37,080	19,060	10,810	5,285	3,350	2,688	2,402	3,261	2,668
18	3,073	609	906	33,120	21,240	5,326	6,080	3,069	2,299	1,988	2,091	2,439
19	2,553	2,589	2,565	33,010	24,480	6,479	5,928	2,386	2,114.	1,863	3,278	2,785
20	2,779	2,656	2,296	32,910	23,670	8,127	5,555	3,761	2,393	2,257	4,066	2,776
21	1,487	2,352	1,975	28,860	20,980	7,337	5.303	3,081	2,421	1,815	4,490	2,406
22	2,805	2,569	2,288	31,370	19,980	7,378	4,357	2,783	2,131	3,959	4,490	2,350
23	2,804	2,368	1,988	32,930	18,410	8,803	5,515	3,010	901	3,672	4,734	1,870
24	8,171	2,236	1,952	28,910	17,090	12,630	5,533	3,547	2,088	3,609	4,482	3,880
25	8,208	1,505	938	22,690	14,430	11,280	5,805	3,280	1,788	3,916	3,055	2,444
26	7,833	2,887	2,056	21,210	16,890	8,161	5,286	2,291	2,081	8,360	3,800	4,105
27	6,943	2,851	1,923	18,240	20,720	5,374	4,851	3,401	1,812	8,608	3,837	3,606
28	5,899	2.865	2,465	17,160	25,210	9,272	4,666	3,445	2,071	8,068	3,827	3,543
29	5,917	....	3,714	19,200	25,890	8,504	3,668	5,220	1,758	7,321	2,375	3,292
30	5,091	....	4,208	20,340	20,980	7,967	3,815	4,909	588	5,678	3,543	2,125
31	3,560	....	5,016	....	19,080	....	5,113	4,648	....	5,049	....	2,998

Monthly discharge of Kennebec River at Waterville.

[Drainage area 4,270 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1893.					
January 12-31	5,000	1,900	2,650	0.621	0.46
February	3,000	2,100	2,350	.550	.57
March	11,300	2,300	4,180	.980	1.13
April	19,800	3,600	11,660	2.73	3.05
May	83,500	13,600	30,520	7.14	8.23
June	23,500	11,000	15,290	3.58	3.99
July	11.230	2,240	5,770	1.35	1.56
August	2,430	1,940	2,270	.531	.61
September	2,680	1,710	2,040	.478	.53
October	4,000	1,440	2,330	.545	.63
November	3,980	1,980	2,230	.522	.58
December	2,780	1,440	1,580	.370	.43
The year	83,500	1,440	6,906	1.62	21.78
1894.					
January	1,910	1,470	1,640	.384	.44
February	1,910	1,740	1,780	.417	.43
March	6,660	1,740	4,020	.940	1.08
April	35,280	4,370	14,680	3.43	3.83
May	15,650	5,840	9,570	2.24	2.58
June	12,930	3,710	7,790	1.82	2.03
July	10,020	3,345	5,720	1.34	1.54
August	3,305	2,294	2,970	.696	.80
September	12,100	467	2,740	.641	.72
October	9,040	1,655	3,750	.878	1.01
November	10,510	1,440	3,760	.881	.98
December	2,600	904	1,930	.452	.52
The year	35,280	467	5,030	1.18	15.97
1895.					
January	2,510	1,135	2,040	.477	.55
February	2,440	579	1,800	.421	.44
March	2,770	1,252	2,000	.467	.54
April	86,200	2,176	23,930	5.60	6.25
May	16,170	4,868	9,580	2.24	2.58
June	9,820	4,497	6,430	1.50	1.67
July	5,040	2,096	3,520	.824	.95
August	5,090	857	2,690	.630	.73
September	2,870	1,104	1,780	.417	.47
October	1,590	1,081	1,250	.292	.34
November	15,900	1,081	5,610	1.31	1.46
December	26,670	1,105	6,030	1.41	1.62
The year	86,200	579	5,555	1.30	17.58
1896.					
January	21,880	1,568	4,300	1.01	1.16
February	4,630	1,292	2,830	.663	.72
March	111,250	3,239	13,140	3.07	3.54
April	74,470	4,998	27,400	6.42	7.16
May	30,880	3,192	17,050	3.99	4.60
June	11,000	3,855	5,520	1.29	1.44
July	11,680	3,335	5,330	1.25	1.44
August	4,740	1,625	3,150	.738	.85
September	7,980	1,733	3,410	.799	.89
October	8,960	2,016	3,660	.857	.99
November	29,860	3,238	9,060	2.12	2.36
December	8,050	1,489	2,750	.643	.74
The year	111,250	1,292	8,130	1.90	25.89
1897.					
January	18,504	1,650	3,587	.839	.97
February	6,225	2,302	3,705	.868	.90
March	6,345	2,007	3,970	.929	1.07
April	66,907	6,334	25,385	5.94	6.63
May	41,284	10,818	26,942	6.30	7.26
June	18,204	7,399	12,970	3.04	3.39
July	55,634	5,218	13,115	3.07	3.54
August	13,656	4,000	7,298	1.71	1.97
September	9,689	2,801	4,595	1.07	1.19
October	6,323	967	2,635	.617	.71
November	13,399	1,889	5,702	1.33	1.48
December	14,005	2,541	5,331	1.25	1.44
The year	66,907	967	9,588	2.25	30.55

Monthly discharge of Kennebec River at Waterville—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1898.					
January	5,434	1,738	3,213	0.752	0.87
February	4,387	2,133	3,402	.797	.83
March	27,432	4,094	11,287	2.64	3.04
April	52,119	6,563	29,833	6.98	7.79
May	39,372	14,611	25,120	5.88	6.78
June	14,341	4,326	9,983	2.34	2.61
July	5,464	1,745	3,908	.917	1.06
August	4,432	913	3,133	.733	.85
September	5,443	1,437	2,618	.613	.68
October	15,319	961	4,047	.947	1.09
November	10,037	2,758	5,178	1.21	1.35
December	3,752	1,723	2,620	.613	.71
The year	52,119	913	8,695	2.03	27.65
1899.					
January	2,757	1,245	2,357	.552	.64
February	3,362	1,420	2,363	.553	.58
March	6,820	1,960	3,218	.754	.87
April	45,795	6,017	24,006	5.62	6.27
May	41,756	11,480	21,303	4.98	5.74
June	13,044	5,673	8,821	2.06	2.30
July	6,509	2,500	5,077	1.19	1.37
August	5,195	1,089	3,302	.773	.89
September	2,635	246	1,854	.434	.48
October	1,969	406	1,274	.298	.34
November	4,109	1,390	2,252	.527	.59
December	5,223	747	2,741	.641	.74
The year	45,724	246	6,547	1.53	20.81
1900.					
January	6,851	656	2,384	.557	.64
February	23,971	1,615	9,050	2.12	2.21
March	20,538	4,373	9,153	2.14	2.47
April	62,291	8,381	28,473	6.66	7.43
May	52,268	14,113	28,272	6.62	7.63
June	25,091	5,015	10,033	2.35	2.64
July	12,281	2,344	5,791	1.35	1.55
August	5,601	1,016	4,173	.977	1.13
September	4,238	1,635	2,807	.657	.74
October	4,190	859	3,065	.718	.83
November	17,580	1,502	6,376	1.49	1.66
December	6,540	1,895	4,096	.959	1.11
The year	62,291	656	9,473	2.22	30.04
1901.					
January	4,040	1,880	3,176	.743	.86
February	3,000	1,430	2,489	.583	.61
March	13,340	700	4,805	1.13	1.30
April	76,590	11,600	41,130	9.63	10.74
May	30,570	5,140	15,169	3.55	4.09
June	15,250	5,140	8,235	1.93	2.15
July	9,080	2,810	5,122	1.20	1.38
August	6,480	1,840	4,178	.979	1.13
September	4,760	750	2,821	.660	.74
October	6,680	670	2,925	.685	.79
November	3,710	480	2,405	.563	.63
December	151,000	170	11,910	2.79	3.21
The year	151,000	170	8,697	2.04	27.58
1902.					
January	10,510	900	3,856	.903	1.04
February	4,840	2,100	3,800	.889	.93
March	57,970	11,790	28,768	6.73	7.76
April	47,870	13,430	22,191	5.19	5.79
May	34,410	5,560	16,873	3.95	4.55
June	33,940	8,400	15,260	3.57	3.98
July	13,200	4,500	7,840	1.83	2.11
August	12,670	1,860	5,057	1.18	1.36
September	7,570	1,580	4,218	.988	1.10
October	24,980	1,750	5,255	1.23	1.42
November	8,020	3,040	4,517	1.06	1.18
December	6,930	1,020	4,346	1.02	1.18
The year	57,970	900	10,165	2.38	32.40

Monthly discharge of Kennebec River at Waterville—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1903.					
January	6,577	2,061	4,011	0.938	1.08
February	4,486	2,003	3,980	.932	.97
March	35,732	6,069	19,395	4.54	5.23
April	23,662	5,531	16,465	3.85	4.30
May	12,725	2,098	7,255	1.70	1.96
June	30,050	2,397	6,691	1.57	1.75
July	9,018	2,445	5,227	1.22	1.40
August	5,624	672	3,875	.907	1.04
September	3,697	115	2,503	.586	.65
October	3,984	100	1,922	.450	.52
November	2,845	115	1,468	.344	.38
December	3,825	100	1,389	.325	.37
The year	35,732	100	6,182	1.45	19.66
1904.					
January	1,909	100	975	.228	.26
February	1,891	100	921	.216	.23
March	11,380	100	3,786	.886	1.02
April	36,110	6,770	14,960	3.50	3.90
May	37,840	8,277	20,716	4.85	5.59
June	14,460	4,670	8,286	1.94	2.16
July	8,263	2,941	5,360	1.25	1.44
August	6,720	2,950	4,705	1.10	1.27
September	8,111	2,610	4,283	1.00	1.12
October	10,460	2,768	4,704	1.10	1.27
November	4,365	658	3,371	.789	.88
December	3,462	100	2,756	.645	.74
The year	36,110	100	6,235	1.46	19.89
1905.					
January	4,182	1,831	3,082	.721	.83
February	3,422	1,200	2,630	.615	.64
March	26,230	714	5,249	1.23	1.42
April	32,120	6,291	13,500	3.16	3.52
May	18,320	7,113	10,520	2.46	2.83
June	9,251	5,109	6,699	1.57	1.75
July	8,591	1,491	4,668	1.09	1.26
August	5,114	100	3,198	.748	.86
September	4,603	100	2,974	.696	.78
October	2,478	100	1,767	.413	.48
November	3,452	100	2,306	.540	.60
December	3,932	914	2,063	.483	.56
The year	32,120	100	4,888	1.14	15.52
1906.					
January	8,208	633	3,212	.752	.87
February	3,792	609	2,279	.534	.56
March	5,016	906	2,290	.536	.62
April	39,390	3,965	17,200	4.03	4.50
May	34,370	14,430	22,290	5.22	6.02
June	21,450	5,326	12,790	3.00	3.35
July	8,801	3,668	6,309	1.48	1.71
August	5,240	2,159	3,665	.858	.99
September	4,089	588	2,530	.593	.66
October	9,178	873	3,797	.889	1.02
November	4,734	2,091	3,428	.803	.90
December	4,105	1,075	2,550	.597	.69
The year	39,390	588	6,862	1.61	21.89

MOOSE RIVER NEAR ROCKWOOD.

This station was established September 7, 1902, by N. C. Grover. It is located 4 miles west of Kineo, near the village of Rockwood and 2 miles from the mouth of the river. It is reached by steamer or rowboat from Kineo. Water is stored by dams at the outlets of several of the lakes and ponds in the basin above, but all of such stored water is used for log driving. The stage of the river changes very slowly after the end of the log-driving season. Practically all of the land areas in this basin are in forest.

The channel is straight above and below the station and is about 220 feet wide at ordinary stages. The banks are high and rocky; the bed of the stream is rocky and permanent; the current is swift at high and medium at low stages.

Discharge measurements are made from a car suspended from a steel cable or by wading at low stages a short distance downstream. The initial point for soundings is on the right bank 1 foot from a birch tree, to which the cable and tag line are fastened.

Gage readings are made twice each day by Peter Callaghan. A standard chain gage is attached to trees on the bank, and at different times temporary staff gages have been placed in the vicinity of the chain gage for use during low water and in winter. All gages are referred to the following bench mark: A copper bolt in a bowlder 8 feet from the corner of the house of Peter Callaghan; elevation, 14.58 feet above the datum of the gages.

Values of monthly means, as given below, for this station are considered to be within 5 per cent of the true flow. Daily discharges are liable to somewhat larger errors, particularly below gage height 1.7 feet.

A view of this station and gage is shown in Pl. II, *A* (p. 26).

Discharge measurements of Moose River near Rockwood.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1902.	*Feet.*	*Sec.-ft.*	1905.	*Feet.*	*Sec.-ft.*
September 7	2.40	385	May 21	6.41	3,460
November 23	3.90	1,168	July 10	3.58	950
			August 14[a]	2.02	280
1903.			November 2[b]	1.56	111
June 7	2.73	498	November 10[b]	1.72	161
September 15	1.85	198			
November 21	1.69	176	1906.		
			November 13	3.25	765

[a] By wading 200 feet below cable. [b] By wading 150 feet below cable.

Daily gage height, in feet, of Moose River near Rockwood.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1902.[a]					1902.				
1	....	3.6	4.6	3.5	17	2.95	3.3	3.9	2.8
2	....	3.6	4.6	3.5	18	2.9	3.25	3.9	2.8
3	....	3.5	4.5	3.5	19	2.9	3.2	3.9	2.8
4	2.5	3.45	4.4	3.4	20	3.1	3.3	3.9	2.8
5	2.4	3.4	4.35	3.4	21	3.4	3.4	3.9	2.8
6	2.4	3.4	4.3	3.4	22	3.7	3.45	3.9	2.85
7	2.4	3.4	4.2	3.35	23	3.8	3.5	3.9	2.9
8	2.4	3.5	4.2	3.25	24	3.8	3.5	3.9	2.9
9	2.4	3.5	4.05	3.15	25	3.8	3.5	3.85	2.9
10	2.5	3.45	4.0	3.1	26	3.75	3.45	3.8	2.9
11	2.5	3.4	3.9	3.0	27	3.7	3.4	3.75	2.9
12	2.6	3.4	3.85	2.95	28	3.7	3.5	3.7	2.9
13	2.6	3.3	3.8	2.9	29	3.65	4.05	3.65	2.9
14	2.75	3.3	3.8	2.9	30	3.6	4.45	3.6	2.9
15	2.85	3.3	3.8	2.8	31	....	4.6	....	2.9
16	2.9	3.3	3.8	2.8					

[a] A number of 1902 gage heights, as previously published, were slightly in error and have been corrected in the above table to agree with observer's original record.

Daily gage height, in feet, of Moose River near Rockwood—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1903.[a]												
1	[b] 2.8	......	......	6.95	5.65	......	......	2.95	2.2	1.5	1.5	1.6
2	2.7	......	......	6.65	5.7	......	......	2.9	2.05	1.4	1.4	1.5
3	2.8	......	......	6.55	5.55	......	......	3.0	2.1	1.5	1.5	1.6
4	2.7	......	......	6.4	......	......	......	2.9	2.0	1.4	1.4	1.5
5	2.8	......	......	6.55	......	......	......	2.9	2.1	1.5	1.5	1.6
6	2.7	......	......	6.5	......	......	......	2.8	2.0	1.4	1.5	1.5
7	2.8	......	......	6.55	......	......	2.7	2.85	2.05	1.5	1.6	1.6
8	2.7	......	......	6.25	......	......	2.6	2.7	1.9	1.4	1.5	1.5
9	2.8	......	......	6.3	......	......	2.7	2.7	2.0	1.5	1.6	1.6
10	2.6	......	......	6.1	......	......	2.6	2.6	1.85	1.4	1.5	1.55
11	......	......	......	6.25	......	......	2.7	2.6	1.9	1.5	1.65	1.7
12	......	......	......	6.15	......	......	2.6	2.6	1.8	1.4	1.6	1.6
13	......	......	......	6.25	......	......	2.6	2.6	1.9	1.5	1.7	1.7
14	......	......	......	6.1	......	......	2.5	2.5	1.8	1.4	1.6	1.6
15	......	......	......	6.2	......	......	2.6	2.55	1.9	1.5	1.7	1.55
16	......	......	......	6.15	......	......	2.5	2.4	1.7	1.4	1.6	1.3
17	......	......	......	6.2	......	......	2.7	2.5	1.8	1.5	1.7	......
18	......	......	......	5.85	......	......	2.6	2.4	1.7	1.4	1.7	......
19	......	......	......	5.85	......	......	2.7	2.55	1.8	1.5	1.8	......
20	......	......	......	5.7	......	......	2.6	2.65	1.65	1.4	1.7	......
21	......	......	5.7	5.7	......	......	2.7	2.85	1.7	1.5	1.8	......
22	......	......	5.65	5.45	......	......	2.55	2.75	1.6	1.4	1.6	......
23	......	......	6.1	5.5	......	......	2.65	2.75	1.7	1.5	1.7	......
24	......	......	6.4	5.4	......	......	2.6	2.6	1.6	1.4	1.6	......
25	......	......	6.9	5.6	......	......	2.65	2.6	1.6	1.5	1.7	......
26	......	......	7.15	5.4	......	......	2.5	2.4	1.5	1.5	1.6	......
27	......	......	7.45	5.5	......	......	2.55	2.45	1.6	1.6	1.6	......
28	......	......	7.4	5.45	......	......	2.4	2.25	1.5	1.5	1.5	......
29	......	......	7.4	5.5	......	......	2.5	2.3	1.6	1.55	1.6	......
30	......	......	7.15	5.5	......	......	2.45	2.1	1.45	1.4	1.5	......
31	......	......	7.15	......	......	......	2.7	2.2	......	1.5	......	......
1904.[a]												
1	......	......	......	......	6.45	4.55	3.9	2.4	2.2	4.6	3.65	2.6
2	......	......	......	......	6.8	4.5	3.85	2.4	2.25	4.95	3.6	2.5
3	......	......	......	......	7.05	4.45	4.0	2.4	2.3	5.0	3.5	2.4
4	......	......	......	......	7.0	4.15	4.1	2.4	2.45	5.0	3.5	2.4
5	......	......	......	......	7.2	4.15	4.0	2.3	2.75	4.95	3.4	2.4
6	......	......	......	......	7.45	4.45	3.9	2.2	2.95	4.9	3.4	2.4
7	......	......	......	......	7.3	4.6	3.75	2.2	3.0	4.8	3.3	2.4
8	......	......	......	......	7.2	4.85	3.65	2.1	3.0	4.7	3.3	2.3
9	......	......	......	......	7.15	4.95	3.5	2.1	2.95	4.55	3.2	2.25
10	......	......	......	1.7	7.25	4.9	3.4	2.05	2.9	4.5	3.1	2.2
11	......	......	......	3.05	7.9	4.95	3.35	2.1	2.9	4.4	3.05	......
12	......	......	......	3.35	8.95	5.15	3.25	2.2	2.85	4.3	3.0	......
13	......	......	......	3.6	9.0	4.95	3.3	2.2	2.8	4.3	3.0	......
14	......	......	......	3.75	8.6	4.7	3.25	2.3	2.8	4.25	3.0	......
15	......	......	......	3.9	8.0	4.55	3.2	2.4	2.85	4.15	3.0	......
16	......	......	......	4.0	7.8	4.35	3.1	2.4	3.1	4.05	3.0	......
17	......	......	......	4.05	7.8	4.15	3.05	2.4	3.35	3.95	2.9	......
18	......	......	......	4.1	7.55	4.0	2.9	2.3	3.4	3.9	2.8	......
19	......	......	......	4.1	7.15	4.0	2.8	2.3	3.6	3.8	2.8	......
20	......	......	......	4.1	6.95	......	2.6	2.35	3.6	3.7	2.8	......
21	......	......	......	4.2	6.75	......	2.5	2.4	3.65	3.7	2.8	......
22	......	......	......	4.2	6.5	......	2.4	2.55	3.7	3.8	2.8	......
23	......	......	......	4.2	6.4	4.55	2.3	2.6	3.7	3.9	2.8	......
24	......	......	......	4.4	6.2	4.55	2.3	2.6	3.7	4.0	2.7	......
25	......	......	......	4.65	5.9	4.6	2.3	2.6	3.85	3.9	2.7	......
26	......	......	......	4.95	5.55	4.5	2.3	2.6	3.95	3.9	2.7	......
27	......	......	......	5.2	5.35	4.45	2.35	2.5	4.1	3.9	2.7	......
28	......	......	......	5.45	5.2	4.45	2.4	2.4	4.2	3.8	2.7	......
29	......	......	......	5.75	4.95	4.5	2.4	2.4	4.2	3.8	2.6	......
30	......	......	......	6.1	4.95	4.1	2.4	2.35	4.4	3.7	2.6	......
31	......	......	......	......	4.85	......	2.4	2.3	......	3.7	......	......

[a] 1903 and 1904 gage heights corrected in the above table on account of an error in gage datum found May 20, 1905. Hence the above gage heights do not agree with those previously published.
[b] River frozen January 11 to March 20 and December 17–31, 1903.

Daily gage height, in feet, of Moose River near Rockwood—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1905.[a]												
1	......	......	......	......	5.95	4.6	4.05	2.55	2.0	1.8	1.5	1.8
2	......	......	......	......	5.95	4.4	4.05	2.5	2.0	1.8	1.6	1.8
3	......	......	......	4.2	6.05	4.55	4.1	2.4	2.0	1.8	1.5	1.8
4	......	......	......	4.45	6.2	4.55	4.1	2.4	2.0	1.8	1.55	1.9
5	......	......	......	4.7	6.3	4.75	4.1	2.3	2.05	1.8	1.6	1.9
6	......	......	......	4.95	6.45	4.6	4.0	2.3	2.1	1.8	1.6	1.9
7	......	......	......	5.0	6.6	4.5	......	2.3	2.1	1.7	1.65	1.9
8	......	......	......	5.15	6.7	4.65	3.85	2.2	2.1	1.7	1.7	1.9
9	......	......	......	5.25	6.85	4.9	3.7	2.2	2.05	......	1.7	1.9
10	......	......	......	......	6.85	5.15	3.6	2.2	2.0	......	1.7	2.0
11	......	......	......	5.3	6.9	5.0	3.5	2.2	2.0	1.7	1.7	2.0
12	......	......	......	5.4	6.85	5.2	3.4	2.2	2.0	1.6	1.7	2.0
13	......	......	......	5.5	6.7	5.1	3.35	2.15	2.0	1.7	1.7	2.0
14	......	......	......	5.65	6.6	5.1	3.25	2.1	1.9	1.7	([b])	2.0
15	......	......	......	5.8	6.35	......	3.2	2.1	1.9	1.7	......	2.0
16	......	......	......	5.85	6.1	4.7	3.1	2.1	1.8	1.7	......	2.0
17	......	......	......	5.8	5.8	4.65	3.05	2.1	1.8	1.6	1.8	2.0
18	......	......	......	5.45	5.7	4.7	3.0	2.05	1.85	1.6	1.8	2.0
19	......	......	......	5.2	6.0	4.6	3.0	2.0	1.9	1.6	1.8	1.9
20	......	......	......	5.15	6.5	4.6	2.95	2.0	1.9	1.6	1.8	1.9
21	......	......	......	5.15	6.5	4.6	2.85	2.0	1.9	1.7	1.8	1.9
22	......	......	......	5.25	6.35	4.6	2.8	2.0	1.9	1.7	1.7	1.9
23	......	......	......	5.3	6.15	4.55	2.8	2.0	1.9	1.65	1.7	1.9
24	......	......	......	5.35	5.9	4.45	2.7	2.0	1.9	1.6	1.8	1.9
25	......	......	......	5.35	5.75	4.4	2.7	2.0	1.9	1.6	1.8	1.9
26	......	......	......	5.35	5.45	4.3	2.6	2.0	1.9	1.6	1.8	......
27	......	......	......	5.45	5.55	4.3	2.6	2.1	1.9	1.6	1.8	1.9
28	......	......	......	5.6	5.45	4.3	2.6	2.1	1.8	1.6	1.8	1.9
29	......	......	......	5.8	5.3	4.25	2.6	2.0	1.8	1.6	1.8	1.9
30	......	......	......	5.9	5.4	4.2	2.6	2.0	1.8	1.5	1.8	1.9
31	......	......	......	......	5.05	......	2.6	2.0	......	1.5	......	1.9
1906.[c]												
1	1.8	2.3	2.1	1.5	6.7	5.85	3.75	2.6	1.9	2.1	3.9	3.0
2	1.8	2.4	2.0	1.5	6.65	5.5	3.6	2.6	1.8	2.1	3.9	3.0
3	1.8	2.4	1.9	1.5	6.85	5.2	3.5	2.5	1.85	2.1	3.9	3.0
4	1.9	2.5	1.9	1.5	7.2	5.25	3.5	2.5	1.95	2.1	3.9	3.0
5	1.9	2.5	1.9	1.5	7.55	5.35	3.4	2.4	2.0	2.1	3.8	3.0
6	1.9	2.6	1.9	1.5	7.85	5.5	3.3	......	1.9	2.1	3.7	2.9
7	1.9	2.6	1.8	1.5	8.0	5.4	3.25	......	1.95	2.1	3.7	2.9
8	1.9	2.6	1.8	1.5	8.0	5.3	3.2	2.3	2.0	2.1	3.6	2.9
9	1.9	2.6	1.8	1.5	8.0	5.35	3.1	2.2	2.05	2.1	3.55	2.9
10	1.8	2.6	1.9	1.5	8.2	5.5	3.1	2.2	2.1	2.1	3.4	3.0
11	1.7	2.6	1.9	1.6	8.55	5.65	3.2	2.15	2.1	2.45	3.4	3.0
12	1.7	......	1.8	1.6	8.6	5.6	3.35	2.1	2.1	2.6	3.4	2.9
13	1.7	......	1.8	1.7	8.5	5.55	3.45	2.0	2.1	2.6	3.3	2.9
14	1.7	......	1.8	1.7	8.4	5.35	3.5	2.0	2.1	2.9	3.3	2.9
15	1.7	......	1.7	1.8	8.3	5.2	3.4	1.95	2.1	3.0	3.3	2.9
16	1.7	2.4	1.7	2.0	8.2	5.35	3.4	1.9	2.1	3.0	3.2	2.8
17	1.7	2.4	1.6	2.25	8.2	5.25	3.3	1.9	2.1	3.0	3.2	2.8
18	1.7	2.3	1.6	2.45	8.3	5.05	3.3	1.85	2.1	3.0	3.2	2.8
19	1.7	2.3	1.6	2.65	8.2	4.75	3.25	1.8	2.1	3.0	3.1	2.8
20	1.7	2.3	1.6	3.05	8.2	4.5	3.2	1.8	2.1	3.0	3.1	2.7
21	1.7	2.3	1.6	3.9	8.2	4.4	3.2	1.8	2.1	3.0	3.0	2.6
22	1.7	2.2	1.6	4.8	8.1	4.45	3.1	1.8	2.1	3.0	3.0	2.6
23	......	2.2	1.6	5.3	7.6	4.5	3.1	1.9	2.1	3.0	3.2	2.6
24	......	2.1	1.5	5.5	7.15	4.5	3.05	1.9	2.1	3.1	3.2	2.6
25	......	2.1	1.5	5.75	6.85	4.45	3.0	1.9	2.1	3.2	2.5	2.6
26	1.9	2.1	1.4	5.85	6.6	4.25	2.95	1.8	2.1	3.45	2.2	2.7
27	2.0	2.1	1.4	6.0	6.5	4.2	2.9	1.9	2.1	3.65	3.3	2.7
28	2.0	2.1	1.4	6.35	6.4	4.05	2.85	1.9	2.1	3.8	3.35	......
29	2.1	......	1.4	6.55	6.45	3.9	2.75	1.9	2.1	4.0	3.3	......
30	2.2	......	1.4	6.6	6.25	3.8	2.7	1.9	2.1	4.0	3.25	......
31	2.2	......	1.4	......	6.05	......	2.7	1.9	......	4.0	......	......

[a] River frozen January 1 to April 2, 1905.
[b] November 14–16, 1905, gage heights omitted, owing to backwater, due to ice.
[c] Gage reader reported no ice near the gage during the winter season 1905–6, with the exception of some along the banks of the river, 5 or 6 feet from the gage. Discharge affected by anchor ice December, 1906. River frozen over at the gage December 7; ice 0.4 foot thick December 9, 1906.

Rating table for Moose River near Rockwood from September 4, 1902, to December 31, 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.30	70	2.60	454	3.90	1,166	5.40	2,432
1.40	88	2.70	496	4.00	1,236	5.60	2,629
1.50	108	2.80	539	4.10	1,308	5.80	2,830
1.60	130	2.90	584	4.20	1,382	6.00	3,035
1.70	154	3.00	631	4.30	1,459	6.20	3,245
1.80	180	3.10	681	4.40	1,538	6.40	3,455
1.90	208	3.20	733	4.50	1,620	6.60	3,670
2.00	238	3.30	788	4.60	1,703	6.80	3,890
2.10	270	3.40	846	4.70	1,788	7.00	4,110
2.20	303	3.50	906	4.80	1,875	7.50	4,685
2.30	338	3.60	968	4.90	1,964	8.00	5,275
2.40	375	3.70	1,032	5.00	2,055	8.50	5,875
2.50	414	3.80	1,098	5.20	2,240	9.00	6,500

[a] This table is applicable only for open-channel conditions. It is based on 11 discharge measurements made during 1902-1906. It is well defined between gage heights 1.5 feet and 6.5 feet.

Monthly discharge of Moose River near Rockwood.

[Drainage area, 680 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1902.					
September 4-30	1,098	375	682	1.00	1.00
October	1,703	733	919	1.35	1.56
November	1,703	968	1,237	1.82	2.03
December	906	539	652	.959	1.11
1903.[a]					
January 1-10	539	454	513	.754	.28
March 21-31	4,628	2,679	3,874	5.70	2.33
April	4,055	2,432	3,061	4.50	5.02
July 7-31	496	375	454	.668	.62
August	631	270	462	.679	.78
September	303	98	184	.271	.30
October	130	88	101	.149	.17
November	180	88	131	.193	.22
December 1-16	154	88	124	.182	.11
1904.[b]					
April 10-30	3,140	154	1,492	2.19	1.71
May	6,500	1,920	4,026	5.92	6.82
June (27 days)	2,194	1,236	1,646	2.42	2.43
July	1,308	338	704	1.04	1.20
August	454	254	358	.526	.61
September	1,538	303	801	1.18	1.32
October	2,055	1,032	1,420	2.09	2.41
November	1,000	454	649	.954	1.06
December 1-10	454	303	370	.544	.20
1905.[c]					
April 3-30	2,932	1,382	2,353	3.46	3.60
May	4,000	2,102	3,189	4.69	5.41
June	2,240	1,382	1,742	2.56	2.86
July	1,308	454	795	1.17	1.35
August	434	238	287	.422	.49
September	270	180	220	.324	.36
October	180	108	147	.216	.25
November 1-13, 17-30	180	108	158	.232	.23
December	238	180	214	.315	.36

[a] River frozen January 11 to March 20 and December 17-31, 1903.
[b] River frozen January 1 to April 9 and December 11-31, 1904.
[c] River frozen January 1 to April 2, 1905. Discharge interpolated on days when gage heights were not read, except November 14-16.

Monthly discharge of Moose River near Rockwood—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1906.					
January [a]	303	154	191	0.281	0.32
February [b]	454	270	370	.544	.57
March	270	88	155	.228	.26
April	3,670	108	1,040	1.53	1.71
May	6,000	3,088	4,786	7.04	8.12
June	2,881	1,098	2,052	3.02	3.37
July	1,065	496	744	1.09	1.26
August	454	180	264	.388	.45
September	270	180	255	.375	.42
October	1,236	270	592	.871	1.00
November	1,166	303	826	1.21	1.35
December [c]	631	454	548	.806	.93
The year	6,000	88	985	1.45	19.76

[a] Discharge interpolated January 23–25, 1906.
[b] Discharge interpolated February 12–15, 1906.
[c] Discharge extrapolated December 28–31, 1906. Discharge values for December, 1906, slightly in excess of their true value owing to ice conditions.

MISCELLANEOUS DISCHARGE MEASUREMENTS IN MOOSE RIVER BASIN.

The following miscellaneous discharge measurements were made in Moose River basin in 1905:

Miscellaneous discharge measurements made in Moose River drainage basin in 1905.

Date.	Hydrographer.	Stream.	Locality.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
				Ft.	*Sq. ft.*	*Ft. per sec.*	*Feet.*	*Sec.-ft.*
Aug. 11	H. K. Barrows.	Miseree Stream	½ mile above Brassua Lake.	15	4.64	0.92	[a] 2.12	4.25
Aug. 12	.....do	Brassua Stream	1½ miles above Brassua Lake.	6	4.06	1.23	[a] 2.12	5.02
Aug. 12	.....do	Moose River	Just above Little Brassua Lake and about 4 miles above Brassua Lake.	90	126	1.91	[a] 2.12	241
Oct. 30	F. E. Pressey	.....do	At outlet of Wood Pond.	82	57	1.12	[b] 1,157.24	64
Oct. 31	.....do	Gander Brook	Near entrance to Wood Pond.	2	.26	.35	[b] 1,157.24	.09
Oct. 31	.....do	Little Wood Pond Stream.	.....do	11	3.1	1.23	[b] 1,157.24	3.8
Nov. 1	.....do	Moose River	Just above Attean Pond. [c]	55	49	1.51	[b] 1,157.28	74

[a] Probable gage height at Rockwood gage.
[b] Altitude above sea level.
[c] Measurement made in rapids; bed very rough, and measurement considered not good; 0.42 inch rain fell at Jackman during night of Ocober 31.

ROACH RIVER AT ROACH RIVER.

Roach River, which has a total drainage area of 120 square miles, enters Moosehead Lake from the east. Its basin is completely forested. Dams at the outlets of several ponds control the flow of the river. The gage is located about 100 feet downstream from the lowest of these dams, at which point the river is so completely under control that the stage does not vary perceptibly for weeks at a time. Impounded water is used for log driving.

This station was established November 10, 1901, by N. C. Grover. It is located near the village of Roach River, and is reached from Greenville Junction by stage or steamer, or from Kineo by steamer.

The channel is straight and about 60 feet wide. Both banks are high and rocky. The bed of the stream is rocky and permanent. The current is moderate.

Discharge measurements are made by wading or from a canoe at a section 140 feet downstream from the gage.

The gage, which is read twice each day by C. H. Sawyer, is a vertical rod spiked to the timber retaining wall on the right bank of the stream. It is referred to bench marks as follows: (1) A cross cut in the highest timber of the crib to which the gage is spiked; elevation, 8.84 feet. (2) A circular chisel draft marked "B. M." on the highest point of a bowlder near a cottage on the left bank about opposite the dam; elevation, 12.57 feet. Elevations refer to the datum of the gage.

Estimates 1901 to 1903 have been revised, the computations being based on the 1904–5 rating table; 1904 and 1905 estimates remain as previously published.

Values for monthly means as given below are considered to be within 5 per cent of the true flow, except for November, 1905, which may be more than 20 per cent in error. Daily discharges may be in error considerably more than 5 per cent, particularly below gage height 2.5 feet, since the gage heights were read to tenths only and the discharge is very small.

Discharge measurements of Roach River at Roach River.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1902.	*Feet.*	*Sec.-ft.*	1905.	*Feet.*	*Sec.-ft.*
September 2	2.50	112	May 22 [a]	4.07	718
Do	2.70	200	Do	4.45	1,000
Do	2.90	286	May 23 [a]	3.59	524
September 3	2.30	72	November 7 [b]	1.95	5.4
Do	2.11	32	Do	1.90	3.4

[a] From canoe about 100 feet below gage.
[b] By wading about 200 feet below gage.

Daily gage height, in feet, of Roach River at Roach River.

Day	Nov.	Dec.	Day.	Nov.	Dec.
1901.			1901.		
1	....	2.3	17	2.3	3.5
2	....	2.3	18	2.3	3.5
3	....	2.3	19	2.2	3.5
4	....	2.3	20	2.2	3.5
5	....	2.3	21	2.2	3.5
6	....	2.3	22	2.2	3.5
7	....	2.3	23	2.2	3.25
8	....	2.3	24	2.2	3.0
9	....	2.3	25	2.2	3.35
10	2.2	2.3	26	2.2	3.65
11	2.2	2.3	27	2.2	3.4
12	2.2	2.3	28	2.2	2.95
13	2.2	2.3	29	2.3	2.8
14	2.35	2.3	30	2.3	2.8
15	2.3	2.65	31	....	2.8
16	2.3	3.1			

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1902.												
1	2.8	2.9	2.6	2.3	5.6	2.5	2.8	2.25	2.5	2.3	2.3	2.5
2	2.8	2.8	2.6	2.3	3.8	2.5	2.8	2.5	2.5	2.3	2.4	2.5
3	2.8	2.8	2.85	2.3	5.4	2.5	2.8	2.5	2.5	2.3	2.5	2.5
4	2.6	2.8	3.0	2.3	3.8	2.5	2.8	2.5	2.5	2.3	2.5	2.5
5	2.6	2.8	3.15	3.75	5.4	2.5	2.8	2.5	2.5	2.3	2.5	2.5
6	2.6	2.8	3.2	5.15	3.8	2.5	2.8	2.5	2.5	2.3	2.5	2.5
7	2.9	2.8	3.2	5.1	3.8	2.5	2.8	2.5	2.5	2.3	2.5	2.5
8	2.9	2.8	3.15	2.3	2.2	2.5	2.8	2.5	2.5	2.3	2.5	2.5
9	2.9	2.8	3.0	5.1	5.5	3.0	2.8	2.5	2.5	2.3	2.5	2.5
10	2.9	2.8	3.0	3.75	3.85	3.0	2.8	2.5	2.4	2.3	2.5	2.5
11	2.9	2.8	3.0	5.2	2.2	3.0	2.8	2.5	2.4	2.3	2.5	2.5
12	2.9	2.8	3.0	3.75	5.5	3.0	2.8	2.5	2.4	2.3	2.5	2.5
13	2.9	2.8	3.0	3.75	3.85	3.0	2.8	2.5	2.4	2.3	2.5	2.5
14	2.9	2.8	3.0	5.2	3.85	3.0	2.8	2.5	2.4	2.3	2.5	2.5
15	2.9	2.6	3.0	3.75	2.2	2.6	2.8	2.5	2.4	2.3	2.5	2.5
16	2.9	2.6	3.0	3.75	5.5	2.6	2.8	2.5	2.4	2.3	2.5	2.5
17	2.9	2.6	3.1	5.2	3.85	2.6	2.8	2.5	2.3	2.3	2.5	2.5
18	2.9	2.6	3.4	5.2	2.2	2.6	2.8	2.5	2.3	2.3	2.5	2.5
19	2.9	2.6	3.5	2.3	2.2	2.6	2.8	2.5	2.3	2.3	2.5	2.5
20	2.9	2.6	4.5	3.75	2.2	2.6	2.8	2.5	2.3	2.3	2.5	2.5
21	2.9	2.6	5.35	3.75	3.85	2.6	2.8	2.5	2.3	2.3	2.5	2.5
22	2.9	2.6	4.0	4.9	3.85	2.8	2.8	2.5	2.3	2.3	2.5	2.5
23	3.1	2.6	4.9	4.9	2.2	2.8	2.8	2.5	2.3	2.3	2.5	2.5
24	3.0	2.6	3.95	5.3	5.5	2.8	2.8	2.5	2.3	2.3	2.5	2.5
25	2.9	2.6	4.2	5.25	5.5	2.8	2.8	2.5	2.3	2.3	2.5	2.2
26	2.9	2.6	3.9	5.1	5.5	2.8	2.8	2.5	2.3	2.3	2.5	2.2
27	2.9	2.6	2.7	2.3	5.5	2.8	2.8	2.5	2.3	2.3	2.5	2.2
28	2.9	2.6	2.2	2.3	3.5	2.8	2.8	2.5	2.3	2.3	2.5	2.2
29	2.9	....	2.25	4.6	3.05	2.8	2.5	2.5	2.3	2.3	2.5	2.2
30	2.9	....	2.3	4.9	2.6	2.8	2.2	2.5	2.3	2.3	2.5	2.2
31	2.9	....	2.3	....	2.6	....	2.2	2.5	....	2.3	....	2.2
1903.[a]												
1	2.2	2.2	2.2	5.2	2.1	2.0	2.2	2.2	2.2	2.1	2.1	2.1
2	2.2	2.2	2.2	5.2	2.1	2.0	2.2	2.2	2.2	2.1	2.1	2.1
3	2.2	2.2	2.2	2.2	2.1	2.0	2.2	2.2	2.2	2.1	2.1	2.1
4	2.2	2.2	2.2	2.2	2.1	2.0	2.2	2.2	2.2	2.1	2.1	2.1
5	2.2	2.2	2.2	2.2	2.1	2.0	2.2	2.2	2.2	2.1	2.1	2.1
6	2.2	2.2	2.2	2.2	2.1	5.0	2.2	2.2	2.2	2.1	2.1	2.1
7	2.2	2.2	2.2	2.2	2.1	5.0	2.2	2.2	2.2	2.1	2.1	2.1
8	2.2	....	2.6	3.8	5.4	5.0	2.2	2.2	2.2	2.1	2.1	2.1
9	2.2	....	3.0	3.8	5.4	5.0	2.2	2.2	2.2	2.1	2.1	2.1
10	2.2	....	3.0	3.8	5.4	5.0	2.2	2.2	2.2	2.1	2.1	2.1
11	2.2	....	3.0	3.8	5.4	5.0	2.2	2.2	2.4	2.1	2.1	2.1
12	2.2	....	3.0	3.8	2.1	2.0	2.2	2.2	2.4	2.1	2.1	2.1
13	2.2	....	3.2	4.0	2.1	2.0	2.2	2.2	2.4	2.1	2.1	2.1
14	2.2	....	3.9	5.8	2.1	2.0	2.2	2.2	2.4	2.1	2.1	2.1
15	2.2	....	3.9	5.6	2.1	2.0	2.2	2.2	2.4	2.1	2.1	2.1

[a] River frozen February 8–27, 1903.

Daily gage height, in feet, of Roach River at Roach River—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
16	2.2	......	3.9	5.4	2.1	2.0	2.2	2.2	2.4	2.1	2.1	2.1
17	2.2	......	3.9	2.2	5.4	2.0	2.2	2.2	2.3	2.1	2.1	2.1
18	2.2	......	3.9	3.8	5.15	2.0	2.2	2.2	2.3	2.1	2.1	2.1
19	2.2	......	3.9	3.8	5.0	2.0	2.2	2.2	2.3	2.1	2.1	2.1
20	2.2	......	3.9	3.8	5.0	2.0	2.2	2.2	2.3	2.1	2.1	2.1
21	2.2	......	3.9	2.2	5.0	2.0	2.2	2.2	2.3	2.1	2.1	2.1
22	2.2	......	3.9	3.8	2.0	2.0	2.2	2.3	2.3	2.1	2.1	2.1
23	2.2	......	2.2	2.15	2.0	2.0	2.2	2.2	2.3	2.1	2.1	2.1
24	2.2	......	2.2	2.1	2.0	2.0	2.2	2.2	2.1	2.1	2.1	2.1
25	2.2	......	2.2	2.1	2.0	5.0	2.2	2.2	2.1	2.1	2.1	2.1
26	2.2	......	4.6	2.1	2.0	5.0	2.2	2.2	2.1	2.1	2.1	2.1
27	2.2	......	4.2	2.1	2.0	2.2	2.2	2.2	2.1	2.1	2.1	2.1
28	2.2	2.2	4.2	2.1	2.0	2.2	2.2	2.2	2.1	2.1	2.1	2.1
29	2.2	......	4.2	2.1	2.0	2.2	2.2	2.2	2.1	2.1	2.1	2.1
30	2.2	......	5.2	2.1	2.0	2.2	2.2	2.2	2.1	2.1	2.1	2.1
31	2.2	......	5.2	......	2.0	......	2.2	2.2	......	2.1	......	2.1
1904. [a]												
1	......	......	......	2.3	4.8	2.3	2.3	2.2	2.2	2.3	2.3	2.1
2	......	......	......	2.3	5.3	5.5	2.3	2.2	2.2	2.3	2.2	2.1
3	......	......	......	2.3	5.55	5.5	2.3	2.2	2.2	2.3	2.1	2.1
4	......	......	......	2.3	5.4	5.5	2.3	2.2	2.6	2.3	2.1	......
5	......	......	......	2.3	5.4	5.5	2.3	2.2	2.25	2.3	2.1	......
6	......	......	......	2.3	5.4	5.5	2.3	4.0	2.3	2.3	2.1	......
7	......	......	......	2.3	5.4	5.5	2.3	3.8	2.3	2.3	2.1	......
8	......	......	......	2.3	5.4	5.5	2.3	3.0	2.55	2.3	2.1	......
9	......	......	......	2.3	2.3	3.3	2.3	3.0	2.8	2.3	2.1	......
10	......	......	......	2.3	2.3	3.3	2.3	3.0	2.8	2.3	2.1	......
11	......	......	......	2.3	2.3	3.3	2.3	2.6	2.3	2.3	2.1	......
12	......	......	......	2.3	5.4	3.3	2.3	2.6	2.3	2.3	2.1	......
13	......	......	......	2.3	5.4	2.5	2.3	3.4	2.3	2.3	2.1	......
14	......	......	......	2.3	2.3	2.5	2.3	3.4	2.3	2.3	2.1	......
15	......	......	......	2.3	2.3	2.5	2.3	3.4	2.3	2.3	2.1	......
16	......	......	......	2.3	2.3	2.5	2.3	2.85	2.3	2.3	2.1	......
17	......	......	......	2.2	5.5	2.3	2.3	2.3	2.3	2.3	2.1	......
18	......	......	......	2.2	5.5	2.3	2.6	2.3	2.3	2.3	2.1	......
19	......	......	......	2.2	2.3	2.3	2.6	2.3	2.3	2.3	2.1	......
20	......	......	......	2.2	2.3	2.3	2.6	2.3	2.3	2.3	2.1	......
21	......	......	......	2.2	5.5	2.3	2.6	2.3	2.3	2.55	2.1	......
22	......	......	......	2.2	5.5	2.3	3.0	2.3	2.3	2.3	2.1	......
23	......	......	......	2.2	2.3	2.3	2.6	2.7	2.3	2.65	2.1	......
24	......	......	......	2.2	3.9	2.3	2.2	2.7	2.3	3.0	2.1	......
25	......	......	......	2.2	3.9	2.3	2.2	2.2	2.3	3.0	2.1	......
26	......	......	2.3	2.2	5.5	2.3	2.2	2.2	2.3	3.0	2.1	......
27	......	......	2.3	2.2	2.3	2.3	2.2	2.2	2.3	3.4	2.1	......
28	......	......	2.3	2.2	5.5	2.3	2.2	2.6	2.3	3.4	2.1	......
29	......	......	2.3	3.3	2.3	2.3	2.2	2.2	2.3	3.4	2.1	......
30	......	......	2.3	4.2	5.5	2.3	2.2	2.2	2.3	3.0	2.1	......
31	......	......	2.3	......	5.5	......	2.2	2.2	......	3.0	......	......
1905. [b]												
1	......	......	......	2.2	3.0	2.6	2.4	2.9	2.1	2.2	1.8	......
2	......	......	......	2.2	4.2	2.6	2.4	2.9	2.1	2.2	1.8	......
3	......	......	......	2.2	2.2	2.6	2.4	2.9	2.1	2.2	1.8	......
4	......	......	......	2.2	4.8	2.6	2.4	2.8	2.1	2.2	1.8	......
5	......	......	......	2.2	2.2	3.8	2.4	2.7	2.1	2.2	1.8	......
6	......	......	......	2.2	2.2	3.5	3.5	2.65	2.1	2.2	1.8	......
7	......	......	......	2.2	5.6	2.6	3.5	2.2	2.1	2.2	1.8	......
8	......	......	......	2.2	3.9	2.6	3.5	2.2	2.1	2.2	1.8	......
9	......	......	......	2.2	3.9	2.6	3.5	2.2	2.1	2.2	1.8	......
10	......	......	......	2.2	5.6	2.6	3.5	2.2	2.1	2.2	1.8	......
11	......	......	......	2.2	3.9	2.6	3.5	2.2	2.1	2.2	1.8	......
12	......	......	......	2.2	2.2	2.6	3.5	2.2	2.1	2.2	1.8	......
13	......	......	......	2.2	5.6	2.6	3.5	2.2	2.1	2.2	1.8	......
14	......	......	......	2.2	2.2	3.0	3.4	2.2	2.1	2.2	1.8	......
15	......	......	......	2.2	3.9	3.4	3.4	2.2	2.1	2.0	1.8	......

[a] River frozen January 1 to March 25 and December 4–31, 1904.
[b] River frozen January 1 to March 20 and November 19 to December 31, 1905.

Daily gage height, in feet, of Roach River at Roach River—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1905.												
16	......	......	......	2.2	5.6	3.0	3.4	2.2	2.1	2.0	1.8	......
17	......	......	......	2.2	5.6	2.6	3.4	2.1	2.1	2.0	1.8	......
18	......	......	......	2.2	2.2	2.5	3.3	2.1	2.1	2.0	1.8	......
19	......	......	......	2.2	5.6	2.5	3.3	2.1	2.1	2.0	......	......
20	......	......	......	2.2	5.6	2.5	3.3	2.1	2.1	2.0	......	......
21	......	......	2.4	2.2	5.6	2.5	3.3	2.1	2.1	2.0	[a] 1.7	......
22	......	......	2.4	2.2	5.05	2.5	3.3	2.1	2.1	2.0	......	......
23	......	......	2.4	2.2	3.6	2.5	3.3	2.1	2.1	2.0	......	......
24	......	......	2.4	2.2	2.6	2.5	3.2	2.1	2.2	2.0	......	......
25	......	......	2.4	3.0	2.6	2.4	3.2	2.1	2.2	2.0	......	......
26	......	......	2.4	3.0	2.6	2.4	3.2	2.1	2.2	2.0	......	......
27	......	......	2.4	3.0	2.6	2.4	3.1	2.1	2.2	2.0	......	......
28	......	......	2.4	3.0	2.6	2.4	3.1	2.1	2.2	2.0	......	......
29	......	......	2.2	3.0	2.6	2.4	3.1	2.1	2.2	2.0	......	......
30	......	......	2.2	3.0	2.6	2.4	3.0	2.1	2.2	2.0	......	......
31	......	......	2.2	......	2.6	......	3.0	2.1	......	2.0	......	......
1906.[b]												
1	......	......	......	......	2.5	2.9	2.5	2.3	2.2	2.2	2.5	2.3
2	......	......	......	......	2.5	4.55	3.6	2.3	2.2	2.2	2.5	2.3
3	......	......	......	......	2.6	6.3	3.6	2.6	2.2	2.2	2.5	2.3
4	......	......	......	......	2.6	5.8	3.6	2.6	2.2	2.2	2.5	2.3
5	......	......	......	......	2.6	3.65	3.6	2.6	2.2	2.2	2.5	2.3
6	......	......	......	......	3.6	2.9	3.6	2.8	2.2	2.2	2.5	2.3
7	......	......	......	......	3.6	2.9	3.6	2.8	2.2	2.2	2.5	2.3
8	......	......	......	......	4.2	2.5	3.6	2.8	2.2	2.4	2.3	2.3
9	......	......	......	......	4.7	2.5	2.2	2.8	2.2	2.4	2.3	2.3
10	......	......	......	......	5.6	2.5	2.2	2.2	2.2	2.4	2.3	2.3
11	......	......	......	......	5.2	2.5	2.2	2.2	2.2	2.4	2.3	2.3
12	......	......	......	......	5.4	2.5	2.2	2.2	2.2	2.4	2.3	2.3
13	......	......	......	......	5.4	2.5	2.2	2.2	2.2	2.4	2.3	2.3
14	......	......	......	......	4.15	2.5	2.2	2.2	2.2	2.4	2.3	2.3
15	......	......	......	2.2	2.9	2.5	2.2	2.2	2.2	2.4	2.3	2.3
16	......	......	......	2.2	2.9	2.5	2.2	2.2	2.2	2.4	2.3	2.3
17	......	......	......	2.2	6.3	2.5	2.2	2.2	2.2	2.4	2.3	2.3
18	......	......	......	2.2	4.2	2.5	2.2	2.2	2.2	2.4	2.3	2.3
19	......	......	......	2.2	2.9	2.5	2.2	2.2	2.2	2.4	2.3	2.3
20	......	......	......	2.2	2.9	2.5	3.3	2.2	2.2	2.4	2.3	2.3
21	......	......	......	2.2	2.9	2.5	3.3	2.2	2.2	2.4	2.3	2.3
22	......	......	......	2.2	6.2	2.5	3.3	2.2	2.2	2.6	2.3	2.3
23	......	......	......	2.2	2.9	2.5	3.3	2.2	2.2	2.6	2.3	2.3
24	......	......	......	2.3	6.2	2.5	3.3	2.2	2.2	2.6	2.3	2.3
25	......	......	......	2.3	2.9	2.5	2.85	2.2	2.2	2.6	2.3	2.3
26	......	......	......	2.35	2.9	2.5	2.4	2.2	2.2	2.6	2.3	2.3
27	......	......	......	2.35	3.25	2.5	2.4	2.2	2.2	2.6	2.3	2.3
28	......	......	......	2.35	3.25	2.5	2.2	2.2	2.2	2.6	2.3	2.3
29	......	......	......	2.35	3.25	2.5	2.2	2.2	2.2	2.6	2.3	2.3
30	......	......	......	2.35	2.9	2.5	2.2	2.2	2.2	2.6	2.3	2.3
31	......	......	......	......	2.9	......	2.2	2.2	......	2.5	......	2.3

[a] November 21, 1905; gage height to top of ice, 1.8 feet; thickness of ice, 0.1 foot.
[b] River frozen January 1 to April 15, 1906, except a small portion of the channel which was open opposite the gage for the greater part of the winter season. The thickness of the ice varied from 0.2 to 0.7 foot. Flow probably somewhat affected by ice conditions December, 1906.

Rating table for Roach River at Roach River, from November 10, 1901, to December 31, 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.80	0.8	2.70	186	3.80	640	4.90	1,170
1.85	1.5	2.80	221	3.90	685	5.00	1,225
1.90	3.4	2.90	258	4.00	730	5.20	1,335
1.95	6.5	3.00	298	4.10	775	5.40	1,445
2.00	12	3.10	338	4.20	820	5.60	1,555
2.10	27	3.20	379	4.30	865	5.80	1,670
2.20	46	3.30	421	4.40	915	6.00	1,790
2.30	68	3.40	463	4.50	965	6.20	1,910
2.40	94	3.50	506	4.60	1,015		
2.50	122	3.60	550	4.70	1,065		
2.60	153	3.70	595	4.80	1,115		

[a] This table is applicable only for open-channel conditions. It is based on 10 discharge measurements made during 1902–1905. It is fairly well defined.

Monthly discharge of Roach River at Roach River.

[Drainage area, 85 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1901.					
November 10–30	81	46	54.0	0.635	0.50
December	572	68	246	2.89	3.33
1902.					
January	338	153	248	2.92	3.37
February	258	153	188	2.21	2.30
March	1,418	46	417	4.91	5.66
April	1,390	68	775	9.12	10.18
May	1,555	46	740	8.71	10.04
June	298	122	194	2.28	2.54
July	221	46	207	2.44	2.81
August	122	57	120	1.41	1.63
September	122	68	90.3	1.06	1.18
October	68	68	68.0	.80	.92
November	122	68	119	1.40	1.56
December	122	46	105	1.24	1.43
The year	1,555	46	273	3.21	43.62
1903.[a]					
January	46	46	46.0	.541	.62
February (8 days)	46	46	46.0	.541	.16
March	1,335	46	468	5.51	6.35
April	1,670	27	479	5.64	6.29
May	1,445	12	408	4.80	5.53
June	1,225	12	340	4.00	4.46
July	46	46	46.0	.541	.62
August	46	46	46.0	.541	.62
September	94	27	56.3	.662	.74
October	27	27	27.0	.318	.37
November	27	27	27.0	.318	.35
December	27	27	27.0	.318	.37
1904.[b]					
March 26–31	68	68	68.0	.800	.18
April	820	46	96.0	1.13	1.26
May	1,528	68	912	10.73	12.37
June	1,500	68	456	5.36	5.98
July	298	46	83.4	.981	1.13
August	730	46	182	2.14	2.47
September	221	46	80.8	.952	1.06
October	463	68	149	1.75	2.02
November	68	27	29.0	.341	.38

[a] River frozen February 8–27, 1903.
[b] River frozen January 1 to March 25 and December 4–31, 1904.

Monthly discharge of Roach River at Roach River—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.[a]					
March 21-31	94	46	80.9	.952	.39
April	298	46	96.4	1.13	1.26
May	1,555	46	668	7,86	9.06
June	640	94	182	2.14	2.39
July	506	94	376	4.42	5.10
August	258	27	71.5	.841	.97
September	46	27	31.4	.369	.41
October	46	12	27.4	.322	.37
November 1-18	.8	.8	.80	.0094	.0069
1906.[b]					
April 15-30	81	46	59.7	.702	.42
May	1,970	122	596	7.01	8.08
June	1,970	122	293	3.45	3.85
July	550	46	232	2.73	3.15
August	221	46	80.4	.946	1.09
September	46	46	46.0	.541	.60
October	153	46	101	1.19	1.37
November	122	68	80.6	.948	1.06
December [c]	68	68	68.0	.800	.92

[a] River frozen January 1 to March 20 and November 19 to December 31, 1905.
[b] River frozen January 1 to April 15, 1906.
[c] Flow probably affected by ice conditions during December, 1906.

MOOSEHEAD LAKE.

A record of gage heights of Moosehead Lake level at Moosehead Lake East Outlet (see description of Moosehead Lake, p. 132) has been kept since April, 1895, by the Hollingsworth & Whitney Company. This record, supplemented by gage readings at Greenville for a portion of the time, has been furnished for publication by the company.

The gages are cast-iron staff gages set to the same datum, and that at Moosehead Lake East Outlet is referred to the following bench mark: A copper bolt set in a large rock near the left end of the dam; elevation 18.428 feet above gage datum, zero of which is approximately 10 feet below the gate sills and 1,011.30 feet above mean sea level. The gage readings in the following table are referred to a datum 10 feet higher—that is, with zero at the sill of the gates.

Gage heights, in feet, of Moosehead Lake.

Date.	Gage height.	Date.	Gage height.	Date.	Gage height.
1895.	*Feet.*	1895.	*Feet.*	1895.	*Feet.*
April 1	1.6	June 21	4.2	September 21	1.2
April 6	1.62	June 28	3.55	September 28	.1
April 12	1.8	July 5	3.55	October 11	.9
April 19	2.75	July 9	3.45	October 15	.85
April 22	3.35	July 13	3.3	October 22	.72
April 26	4.15	July 19	3.08	October 24	.7
May 3	5.15	July 26	2.75	November 1	.65
May 6	5.55	August 3	2.65	November 8	.65
May 10	5.9	August 9	2.45	November 15	.95
May 13	6.12	August 17	2.25	November 22	1.7
May 17	6.7	August 20	1.9	November 29	2.45
May 22	6.92	August 23	1.8	December 6	3.05
May 24	6.5	August 27	1.85	December 13	3.5
May 31	6.0	August 30	1.8	December 20	3.65
June 7	5.5	September 6	1.55	December 27	4.04
June 14	5.05	September 13	1.3		

Gage heights, in feet, of Moosehead Lake—Continued.

Date.	Gage height.	Date.	Gage height.	Date.	Gage height.
1896.	*Feet.*	1897.	*Feet.*	1898.	*Feet.*
January 3	4.7	April 16	4.0	September 2	1.85
January 10	5.5	April 23	4.7	September 9	1.95
January 17	5.2	April 30	6.8	September 16	1.75
January 24	5.3	May 7	7.55	September 23	1.6
January 31	5.2	May 14	7.6	September 30	1.7
February 7	5.2	May 21	7.55	October 6	1.75
February 14	5.1	May 28	7.6	October 7	1.75
February 21	4.9	June 4	7.6	October 10	1.65
February 28	4.75	June 11	7.45	October 14	1.35
March 6	5.0	June 18	7.15	October 17	1.7
March 13	5.05	June 25	6.6	October 21	1.85
March 20	5.3	July 2	6.15	October 24	1.95
March 27	5.25	July 9	5.75	October 28	2.15
April 3	5.45	July 16	6.02	November 4	2.5
April 10	5.4	July 23	5.95	November 11	2.6
April 17	5.6	July 30	5.8	November 18	2.9
April 22	6.75	August 6	5.7	November 25	3.2
April 24	6.8	August 13	5.35	December 2	3.55
April 26	6.9	August 20	5.15	December 9	3.8
May 1	7.35	August 27	4.75	December 16	3.85
May 5	7.3	September 3	4.35	December 23	3.9
May 8	7.35	September 10	3.8	December 30	3.95
May 10	7.4	September 17	3.25	December 31	3.95
May 12	7.45	September 24	3.2		
May 15	7.4	October 1	3.05	1899.	
May 22	6.85	October 8	2.95	January 6	3.85
May 29	6.25	October 15	2.97	January 13	3.8
June 5	6.02	October 22	2.95	January 20	3.8
June 13	5.8	October 29	2.85	January 27	3.75
June 20	5.45	November 5	2.95	January 28	3.75
June 26	5.15	November 12	3.2	February 3	3.7
July 3	4.64	November 20	3.25	February 5	3.6
July 11	4.5	November 26	3.25	February 10	3.5
July 17	4.2	December 3	3.55	February 12	3.45
July 24	3.9	December 10	3.85	February 19	3.4
July 31	3.5	December 17	4.25	February 24	3.2
August 7	3.15	December 24	4.6	February 25	3.2
August 14	2.8	December 31	4.75	March 3	3.0
August 21	2.5			March 10	2.85
August 28	2.1	1898.		March 15	2.75
September 4	1.8	January 2	4.7	March 17	2.7
September 11	2.0	January 7	4.75	March 24	2.9
September 18	1.8	January 14	4.65	March 31	2.95
September 25	1.7	January 21	4.65	April 4	2.8
October 2	1.75	January 28	4.7	April 7	2.9
October 9	1.75	February 4	4.65	April 9	2.9
October 16	1.8	February 11	4.45	April 14	2.95
October 23	1.95	February 18	4.35	April 21	3.5
October 30	2.25	February 25	4.5	April 27	5.0
November 6	2.7	February 28	4.35	April 28	5.05
November 13	3.3	March 2	4.35	May 5	7.4
November 20	3.7	March 4	4.3	May 12	7.45
November 27	4.8	March 8	4.0	May 19	7.15
December 5	4.45	March 10	3.85	May 26	6.65
December 11	4.5	March 11	3.75	June 2	6.5
December 18	4.65	March 18	3.45	June 9	6.25
December 25	4.65	March 20	3.35	June 16	5.8
December 30	4.6	March 25	3.2	June 23	5.35
-		April 1	3.3	June 30	4.75
1897.		April 4	3.4	July 7	4.45
January 1	4.55	April 6	3.1	July 14	4.4
January 6	4.65	April 8	3.75	July 21	4.5
January 8	4.65	April 15	4.4	July 28	4.45
January 11	4.65	April 22	5.7	August 4	4.2
January 15	4.65	April 29	6.9	August 11	3.9
January 23	4.65	May 6	7.2	August 18	3.75
January 27	4.6	May 13	7.6	August 25	3.5
January 29	4.6	May 20	7.55	September 1	3.2
February 5	4.45	May 27	7.2	September 8	2.8
February 12	4.3	June 10	6.6	September 15	2.5
February 19	4.1	June 17	6.3	September 22	2.25
February 23	4.1	June 24	5.75	September 29	1.95
February 26	4.1	July 1	5.25	October 6	1.9
March 5	3.9	July 8	4.75	October 13	1.75
March 9	3.75	July 16	4.05	October 20	1.65
March 12	3.8	July 22	3.75	October 27	1.4
March 15	3.8	July 29	3.35	November 3	1.4
March 19	3.75	August 5	3.2	November 10	1.5
March 26	3.8	August 12	2.9	November 17	1.2
April 2	3.85	August 19	2.5	November 24	1.5
April 9	3.9	August 26	2.2	December 1	1.4

Gage heights, in feet, of Moosehead Lake—Continued.

Date.	Gage height.	Date.	Gage height.	Date.	Gage height.
1899.	*Feet.*	1900.	*Feet.*	1901.	*Feet.*
December 4	1.5	December 14	3.9	December 27	3.4
December 8	1.6	December 21	3.85	December 30	3.7
December 12	1.35	December 28	3.8		
December 15	1.55			1902.	
December 22	1.7	1901.		January 3	3.9
December 29	1.8	January 4	3.6	January 10	4.05
		January 11	3.5	January 17	4.15
1900.		January 18	3.4	January 24	4.25
January 2	1.8	January 25	3.25	January 31	4.3
January 5	.75	February 1	3.25	February 3	4.5
January 12	.8	February 8	3.2	February 7	4.3
January 19	.7	February 15	3.0	February 14	4.1
January 26	.95	February 22	2.8	February 21	3.95
February 2	2.2	March 1	2.6	February 28	3.8
February 9	2.45	March 8	2.0	March 7	4.0
February 16	2.5	March 15	1.4	May 4	7.9
February 23	2.7	March 22	1.5	May 9	8.0
March 2	3.25	March 29	1.75	May 16	7.9
March 9	3.6	April 5	2.5	May 23	7.55
March 16	3.7	April 12	3.5	May 27	7.8
March 23	3.8	April 19	6.1	May 29	7.95
March 30	3.6	April 26	7.6	May 30	8.0
April 6	3.4	May 3	7.5	June 6	7.8
April 13	3.3	May 10	7.5	June 13	7.8
April 20	3.9	May 17	7.5	June 15	7.65
April 27	6.15	May 24	7.45	June 20	7.5
May 4	7.0	May 31	7.1	June 27	7.65
May 11	7.45	June 7	6.6	July 4	7.7
May 20	7.8	June 14	6.4	July 11	7.3
June 1	7.6	June 21	6.05	July 19	6.75
June 22	6.7	June 30	5.7	July 25	6.3
June 29	6.3	July 14	5.25	August 1	5.85
July 6	5.95	July 19	4.85	August 8	5.65
July 13	5.65	July 26	4.4	August 15	5.4
July 20	5.8	August 2	4.0	August 22	5.15
July 27	5.8	August 9	4.0	August 29	5.0
August 3	5.6	August 16	4.4	September 6	4.85
August 10	5.25	August 23	4.4	September 12	4.8
August 17	4.85	August 30	4.25	September 19	4.7
August 24	4.45	September 6	4.1	September 26	4.85
August 31	4.1	September 13	3.75	October 4	4.95
September 7	3.7	September 20	3.4	October 10	4.95
September 14	3.15	September 27	3.2	October 17	4.85
September 21	2.9	October 4	3.0	October 24	4.75
September 28	2.9	October 11	2.5	October 30	4.9
October 5	2.25	October 18	2.3	November 14	5.7
October 12	2.5	October 25	2.4	November 17	5.5
October 19	2.5	November 1	2.1	November 21	5.8
October 26	2.5	November 8	1.85	November 28	5.75
November 2	2.4	November 15	1.85	December 5	5.7
November 9	2.2	November 22	1.7	December 12	5.3
November 16	2.8	November 29	1.55	December 19	5.1
November 23	3.3	December 6	1.45	December 26	5.5
November 30	3.8	December 13	1.25		
December 7	3.85	December 20	2.6		

Date.	Gage height.		Date.	Gage height.		Date.	Gage height.	
	Outlet.	Greenville.		Outlet.	Greenville.		Outlet.	Greenville.
1903.	*Feet.*	*Feet.*	1903.	*Feet.*	*Feet.*	1903.	*Feet.*	*Feet.*
January 2	4.95	....	April 1	6.36	....	May 9	6.91	....
January 8	5.65	....	April 3	6.5	....	May 11	....	6.9
January 9	4.8	....	April 10	6.2	....	May 12	....	6.9
January 14	5.65	....	April 12	6.5	....	May 13	6.9	6.8
January 16	4.6	....	April 14	6.65	....	May 15	6.85	6.8
January 23	4.55	....	April 17	6.6	....	May 16	....	6.8
January 30	4.45	....	April 21	6.2	....	May 19	6.75	6.6
February 6	4.25	....	April 24	6.0	....	May 22	6.7	....
February 13	4.5	....	April 27	6.3	....	May 27	6.45	....
February 22	3.8	....	April 28	6.35	....	May 29	6.3	....
March 1	3.45	....	April 30	6.4	....	June 2	6.05	....
March 6	3.0	....	May 2	....	6.5	June 4	5.9	....
March 13	3.1	....	May 3	6.75	....	June 6	5.8	....
March 20	3.9	....	May 5	....	6.8	June 10	5.6	....
March 23	4.5	....	May 6	6.95	....	June 12	5.55	....
March 27	5.4	....	May 8	....	6.9	June 17	5.8	....

Gage heights, in feet, of Moosehead Lake—Continued.

Date.	Gage height. Outlet.	Gage height. Greenville.
1903.	*Feet.*	*Feet.*
June 19	5.75	5.8
June 20		5.75
June 21	5.7	
June 22		5.7
June 23	5.55	5.65
June 24		5.6
June 25	5.6	5.55
June 26		5.55
June 27		5.55
June 28	5.4	
June 29		5.45
June 30	5.05	5.3
July 1		5.25
July 2	5.2	5.15
July 3	5.4	5.2
July 6	4.9	
July 9	4.8	4.8
July 10		4.75
July 11		4.75
July 12	4.7	
July 13		4.7
July 14		4.65
July 15	4.35	4.6
July 16		4.55
July 17	4.45	4.55
July 18		4.5
July 19	4.35	
July 20		4.4
July 21	4.2	4.3
July 22		4.25
July 23		4.2
July 24	4.15	4.25
July 25		4.15
July 26	4.05	
July 27		4.3
July 28		4.0
July 29	3.9	3.9
July 30		3.9
July 31	3.87	3.95
August 1		3.9
August 3		3.85
August 4	3.7	3.8
August 5		3.7
August 6		3.65
August 7	3.6	
August 8		3.6
August 9	3.5	
August 10		3.45
August 11		3.45
August 12		3.4
August 13		3.45
August 14	3.25	3.35
August 15		3.35
August 17	3.4	3.25
August 18		3.25
August 19		3.15
August 20		3.2
August 21	3.15	
August 22		3.3
August 24	3.3	3.3
August 25		3.3
August 26	3.25	3.3
August 27		3.25
August 28	3.2	3.25
August 29		3.2
August 31	3.1	
September 1		3.1
September 3		3.0
September 4	2.9	
September 5		3.0
September 7	2.75	2.9
September 8		2.8
September 9		2.7
September 10	2.6	2.6
September 11		2.6
September 12		2.55

Date.	Gage height. Outlet.	Gage height. Greenville.
1903.	*Feet.*	*Feet.*
September 13	2.5	
September 14		2.5
September 15	2.4	2.4
September 16		2.4
September 17		2.35
September 18	2.2	2.35
September 19		2.3
September 21		2.15
September 22		2.15
September 23	1.9	2.0
September 24		1.95
September 25	1.6	1.95
September 26		1.85
September 28	1.6	1.7
September 29		1.75
September 30		1.7
October 1		1.6
October 2	1.5	
October 3		1.55
October 5		1.45
October 6		1.45
October 9	1.2	
October 11	1.2	
October 12		1.25
October 13		1.25
October 14		1.2
October 15		1.15
October 16	1.05	1.05
October 17		1.0
October 19		1.0
October 20	.9	.9
October 21		.95
October 23	.75	.85
October 26	.7	
October 29		.75
October 30	.6	
October 31		.7
November 2		.7
November 3		.65
November 4		.7
November 6	.6	.7
November 7		.8
November 9		.6
November 10		.6
November 11		.6
November 13	.5	
November 20	.45	
November 27	.2	
December 4	.15	(a)
1904.		
April 29	1.35	1.85
April 30		1.95
May 2		2.25
May 3	2.2	2.45
May 4		2.6
May 5		2.95
May 6	3.0	3.15
May 7		3.5
May 9		3.9
May 11		4.45
May 12		4.9
May 13	5.0	5.2
May 14		5.45
May 16		5.9
May 17		6.1
May 18	5.9	6.25
May 19		6.45
May 20		6.6
May 21		6.65
May 22	6.5	
May 23	6.6	6.8
May 24		6.9
May 25	6.8	7.0
May 26		7.0
May 27	6.9	7.0
May 28		7.1

Date.	Gage height. Outlet.	Gage height. Greenville.
1904.	*Feet.*	*Feet.*
May 30	7.1	7.0
May 31		7.1
June 1		7.0
June 2		6.95
June 3	7.0	6.95
June 4		7.0
June 6	6.95	7.0
June 8	7.5	
June 9		7.05
June 10	7.2	
June 13	6.9	6.95
June 14		6.85
June 15	6.75	6.7
June 16		6.75
June 17	6.5	6.7
June 18		6.65
June 20	6.45	6.6
June 21		6.4
June 22		6.35
June 23		6.4
June 24	6.3	
June 25		6.3
June 27	5.95	6.25
June 28		6.15
June 29	6.1	
June 30		6.0
July 1	6.05	6.0
July 2		6.0
July 4	6.1	
July 6	6.0	
July 7		6.0
July 8	5.9	6.05
July 9		6.0
July 11	5.9	5.9
July 12	5.9	5.9
July 13		5.9
July 14		6.0
July 15	5.9	5.95
July 16		5.9
July 18	5.8	5.85
July 19		5.8
July 20	5.7	5.75
July 21		5.7
July 22	5.55	5.65
July 23		5.6
July 25	5.3	5.5
July 26		5.45
July 27	5.2	5.4
July 28		5.25
July 29	5.15	5.2
July 30		5.2
August 1	5.0	
August 2		4.95
August 3	4.75	4.9
August 4		4.85
August 5	4.7	4.75
August 8		4.5
August 10		4.45
August 11		4.35
August 12	4.3	4.4
August 13		4.3
August 15	4.2	4.25
August 16		4.25
August 17	4.1	4.15
August 18		4.15
August 19	4.05	
August 20		4.1
August 22	4.05	4.0
August 24	4.5	4.05
August 25		4.05
August 26	3.95	4.0
August 27		4.0
August 29	3.85	
August 30		3.8
August 31	3.7	
September 1		3.65
September 2	3.55	3.55

[a] From about December 4, 1903, to April 29, 1904, no gage readings were obtained, as water was below the bottom of the gage.

Gage heights, in feet, of Moosehead Lake—Continued.

Date	Gage height.		Date.	Gage height.		Date.	Gage height.	
	Outlet.	Greenville.		Outlet.	Greenville.		Outlet.	Greenville.
1904.	*Feet.*	*Feet.*	1905.	*Feet.*	*Feet.*	1905.	*Feet.*	*Feet.*
September 3		3.55	February 17	1.5		June 27		6.2
September 5	3.6		February 20	1.35		June 28	6.5	
September 6		3.7	February 23	1.2		June 29		6.0
September 7	3.55	3.55	February 24	1.2		June 30	5.95	5.95
September 8		3.5	February 28	1.1		July 1		5.9
September 9	3.5	3.5	March 10	.6		July 3	5.95	6.0
September 10		3.45	March 13	.6		July 4		5.9
September 12	3.4	3.35	March 15	.45		July 5	5.7	5.85
September 13		3.4	March 17	.4		July 6		5.8
September 14	3.35	3.3	March 20	.4		July 7	5.65	5.8
September 15		3.35	March 22	.4		July 8		5.75
September 16	3.5	3.35	March 24	.3		July 10	5.65	5.75
September 17		3.45	March 31		1.6	July 11		5.7
September 19	3.65		April 1		1.65	July 12	5.55	5.6
September 26	3.8		April 3		1.8	July 13		5.55
September 28	3.85		April 4		1.8	July 14	5.5	5.5
September 30		3.9	April 5	1.0	1.9	July 15		5.5
October 1		4.1	April 6		2.0	July 17	5.33	5.35
October 3	4.35	4.25	April 7	2.05	2.15	July 18		5.35
October 4		4.35	April 8		2.25	July 19	5.25	5.3
October 5	4.45	4.35	April 10	2.45	2.4	July 20		5.25
October 6		4.45	April 11		2.5	July 21	5.06	5.15
October 7		4.55	April 12	2.7	2.6	July 22		5.1
October 8	4.55		April 13		2.75	July 24	4.8	4.9
October 9		5.1	April 14	2.9	2.9	July 25		4.8
October 10	4.8	4.5	April 15		3.0	July 26	4.7	4.8
October 12	4.8	4.65	April 17		3.25	July 27		4.7
October 14		4.7	April 18	3.35	3.35	July 28	4.65	4.7
October 17	4.6	4.65	April 19		3.35	July 31	4.6	4.55
October 19	4.6		April 20		3.5	August 1		4.5
October 21	4.7	4.6	April 21	3.55	3.6	August 2	4.55	4.45
October 24	4.85		April 22		3.8	August 3		4.4
October 25		4.8	April 24	3.85	3.95	August 4	4.3	4.35
October 26	4.9		April 25		4.0	August 5		4.3
October 27		4.95	April 26	4.05	4.1	August 7	4.2	
October 28	4.95		April 27		4.25	August 8		4.2
October 31	5.05	5.05	April 28	4.3		August 9	4.1	
November 2	5.5	5.05	April 29		4.45	August 10		4.0
November 4		5.15	May 1	4.6	4.7	August 11	4.1	
November 7	4.9	5.15	May 2		4.75	August 12		3.95
November 9	4.85		May 3	4.95	4.8	August 14	3.85	3.9
November 11	5.0		May 4		5.05	August 15		3.85
November 14	5.5	5.1	May 5	5.25	5.1	August 16	3.8	3.8
November 18	5.1		May 6		5.25	August 18	3.55	
November 23	5.0		May 8	5.6	5.6	August 19		3.6
November 25	5.0		May 9		5.6	August 21	3.45	3.5
November 28	4.95		May 10	5.85	5.9	August 22		3.4
November 30	4.9		May 11		5.9	August 23	3.35	3.4
December 2	4.85		May 12	6.0	5.95	August 25	3.25	3.35
December 5	4.8		May 13		5.9	August 26		3.3
December 7	4.75		May 15	6.1	6.1	August 28	3.15	
December 9	4.8		May 16		6.1	August 30		3.1
December 12	4.75		May 17	6.2	6.15	August 31	3.05	3.05
December 14	4.75		May 18		6.2	September 1	2.95	3.0
December 16	4.7		May 19	6.45	6.3	September 2		2.95
December 19	4.6		May 20		6.5	September 4	2.9	2.95
December 21	4.55		May 22	6.7	6.75	September 5		2.9
December 23	4.3		May 23		6.8	September 6	2.85	3.0
December 25	4.2		May 24	6.7	6.75	September 7		3.0
December 28	4.15		May 25		6.7	September 8	2.8	2.9
			May 26	6.6	6.7	September 9		2.85
1905.			May 27		6.8	September 11	2.75	2.75
January 3	4.0		May 29	6.7	6.75	September 12		2.7
January 4	3.9		May 30		6.8	September 13		2.7
January 6	3.85		May 31	6.7	6.75	September 14		2.8
January 10	3.7		June 1		6.75	September 15	2.65	2.6
January 11	3.55		June 2		6.6	September 18	2.5	2.45
January 13	3.5		June 3		6.8	September 19		2.55
January 16	3.4		June 5		6.6	September 20	2.45	2.6
January 18	3.0		June 6		6.65	September 21		2.5
January 21	2.9		June 7		6.5	September 22	2.47	2.45
January 28	2.2		June 8		6.45	September 23		2.45
January 30	2.0		June 9		6.4	September 25		2.45
February 2	1.9		June 13		6.35	September 26		2.6
February 3	1.85		June 19	6.3		September 27	2.35	2.3
February 6	1.75		June 21	6.3		September 28		2.3
February 8	1.85		June 23	6.2		September 29	2.25	2.3
February 10	1.8		June 24		6.25	September 30		2.25
February 15	1.7		June 26	6.1	6.1	October 2	2.2	2.2

Gage heights, in feet, of Moosehead Lake—Continued.

Date.	Gage height. Outlet.	Gage height. Greenville.
1905.	*Feet.*	*Feet.*
October 4		2.15
October 5		2.25
October 6	2.15	2.15
October 7		2.1
October 9	2.05	2.1
October 10		2.0
October 11		1.9
October 12	1.8	1.85
October 13		1.9
October 16	1.8	1.8
October 18		1.75
October 19	1.7	1.75
October 20		1.7
October 21	1.7	1.75
October 23	1.7	1.7
October 24		1.65
October 25	1.7	1.7
October 26		1.6
October 27	1.5	1.55
October 28		1.5
October 30	1.55	
October 31		1.4
November 1	1.5	1.3
November 2		1.4
November 3	1.35	1.3
November 4		1.3
November 6	1.3	1.3
November 7		1.35
November 8	1.25	1.3
November 9		1.3
November 10	1.3	
November 13	1.3	1.35
November 15	1.27	1.35
November 17	1.25	1.15
November 18		1.25
November 20	1.18	1.15
November 21		1.15
November 24	1.0	1.0
November 25		1.0
November 27	.95	
November 28		1.0
November 29	1.05	
November 30		1.0
December 1	.9	
December 4	.8	
December 5		.9
December 6	.78	
December 7		.9
December 8	.78	
December 9		.9
December 11	.95	
December 12		.9
December 14	.9	
December 15	.8	
December 18	.7	
December 20	.75	
December 24	.7	
December 25	.6	
December 27	.6	
December 29	.5	
1906.[a]		
January 2	.5	
January 4	.5	
January 5	.45	
January 10	.4	
January 13	.35	
January 15	.4	
January 17	.3	
January 19	.3	
January 22	.25	
January 24	.25	
January 26	.5	
January 29	.45	
January 31	.5	
February 2	.5	
February 5	.45	

Date.	Gage height. Outlet.	Gage height. Greenville.
1906.	*Feet.*	*Feet.*
February 7	0.4	
February 9	.35	
February 12	.3	
February 14	.5	
February 16	.6	
February 19	.7	
February 21	.7	
February 27	.8	
February 28	.8	
March 3	.8	
March 5	.7	
March 7	.7	
March 9	.7	
March 12	.7	
March 13	.75	
March 16	.8	
March 20	.86	
March 21	.9	
March 24	.9	
March 26	.9	
March 28	.8	
March 30	.8	
April 2	.9	
April 4	.95	
April 6	.95	
April 9	1.0	
April 11	1.0	
April 17	1.1	
April 18	1.2	
April 23	1.8	
April 25	2.05	
April 27	2.4	
April 30	2.88	
May 1		3.0
May 2	3.3	3.15
May 4	3.75	4.4
May 5		3.85
May 7	4.58	
May 8		4.6
May 9	5.05	4.9
May 10		5.35
May 11	5.9	5.75
May 12		6.0
May 14	5.95	6.55
May 15		6.85
May 16	7.15	7.1
May 17		7.2
May 18	7.32	7.35
May 19		7.4
May 21		7.5
May 23	7.5	7.5
May 24		7.5
May 25		7.55
May 28	7.5	
May 29		7.55
May 30	7.45	7.6
May 31		7.5
June 1	7.46	7.45
June 2		7.45
June 4	7.45	7.4
June 5		7.45
June 6	7.42	7.5
June 7		7.5
June 8	7.4	7.4
June 9		7.4
June 11	7.4	7.5
June 12		7.5
June 13	7.4	7.5
June 14		7.4
June 15	7.35	7.4
June 16		7.35
June 18	7.25	7.3
June 19		7.25
June 20	7.1	7.2
June 21		7.1
June 22	7.0	7.1
June 23		7.0

Date.	Gage height. Outlet.	Gage height. Greenville.
1906.	*Feet.*	*Feet.*
June 25	7.1	7.0
June 26		7.15
June 27	7.05	7.15
June 28		7.1
June 29	6.95	7.0
June 30		7.0
July 1	6.85	
July 2	6.7	
July 3		6.7
July 4	6.55	6.55
July 5		6.6
July 6	6.35	6.5
July 7		6.35
July 9	6.15	
July 10		6.1
July 11	6.0	6.1
July 12		6.0
July 13	5.9	5.95
July 14		5.9
July 16	5.7	5.75
July 17		5.6
July 18	5.6	5.7
July 19		5.6
July 20	5.5	5.55
July 21		5.5
July 23	5.4	5.4
July 24		5.4
July 25	5.33	5.4
July 26		5.35
July 27	5.2	
July 28		5.2
July 30	5.0	4.45
July 31		5.05
August 1	4.9	4.95
August 2		4.95
August 3	4.8	4.9
August 4		4.8
August 6	4.65	4.65
August 7		4.65
August 8	4.5	4.65
August 9		4.5
August 10	4.35	
August 11		4.25
August 13	4.1	4.25
August 14		4.2
August 15	3.95	4.15
August 16		4.0
August 17	3.85	3.9
August 18		3.85
August 20	3.75	3.75
August 21		3.7
August 22		3.65
August 23		3.65
August 24	3.6	3.7
August 25		3.6
August 27	3.4	3.45
August 29	3.3	
August 30		3.2
August 31	3.15	3.2
September 1		3.2
September 3	3.1	3.1
September 4		3.1
September 5	2.95	3.1
September 6		3.0
September 7	2.85	3.0
September 8		3.0
September 10	2.75	2.9
September 11		2.8
September 12	2.75	2.8
September 13		2.8
September 14	2.5	2.8
September 15		2.8
September 17	2.45	2.5
September 18		2.5
September 19	2.4	2.5
September 20		2.5
September 21	2.4	2.4

[a] Lake frozen over January 1 to May 13 and December 2–31, 1906.

Gage heights, in feet, of Moosehead Lake—Continued.

Date.	Gage height.		Date.	Gage height.		Date.	Gage height.	
	Outlet.	Greenville.		Outlet.	Greenville.		Outlet.	Greenville.
1906.	*Feet.*	*Feet.*	1906.	*Feet.*	*Feet.*	1906.	*Feet.*	*Feet.*
September 22	....	2.2	October 20	....	2.2	November 17	....	2.9
September 24	2.3	....	October 22	2.1	2.2	November 19	3.05	3.0
September 26	2.2	2.1	October 23	....	2.2	November 20	....	3.0
September 27	....	2.1	October 24	2.2	....	November 21	3.0	3.1
September 28	2.15	2.1	October 25	....	2.2	November 22	....	3.0
September 29	....	2.0	October 26	2.5	....	November 23	3.2	3.2
September 30	2.1	....	October 27	....	2.3	November 24	....	3.3
October 1	....	2.0	October 29	2.6	2.5	November 26	3.3	....
October 2	....	2.0	October 30	....	2.4	November 27	....	3.3
October 3	2.05	2.0	October 31	2.8	2.4	November 28	3.3	3.3
October 4	....	2.0	November 1	....	2.4	November 29	....	3.3
October 5	2.0	1.9	November 2	2.8	2.5	November 30	3.3	3.3
October 6	....	1.8	November 3	....	2.5	December 3	3.25	....
October 8	1.9	1.9	November 5	2.85	2.8	December 6	3.3	3.3
October 9	....	1.6	November 6	....	2.8	December 7	3.3	4.3
October 10	2.1	1.9	November 7	2.9	2.9	December 12	3.25	....
October 11	....	1.9	November 8	....	2.9	December 14	3.2	....
October 12	2.15	1.9	November 9	3.0	2.9	December 17	3.2	....
October 13	....	2.1	November 10	....	2.9	December 19	3.2	....
October 15	2.2	....	November 12	3.0	2.9	December 21	3.2	....
October 16	....	2.2	November 13	....	2.9	December 24	3.15	....
October 17	2.2	2.2	November 14	2.9	2.9	December 26	3.3	....
October 18	....	2.2	November 15	....	2.9	December 28	3.35	....
October 19	2.15	2.2	November 16	3.0	2.9			

DEAD RIVER NEAR THE FORKS.

Dead River has its headwaters in the mountains between Maine and Canada and flows in a general easterly direction, entering the Kennebec at The Forks. Its basin is 40 miles in extreme length by 30 miles in width and is almost entirely covered with forests. For a large portion of its length the river flows through swamps; in its lower course it has considerable fall. The only dams on the stream are owned by the log-driving companies, and the gates are kept open after the drives are out of the river.

This gaging station was established September 29, 1901, by N. C. Grover. It is located 1½ miles west of The Forks.

The channel is straight for 500 feet above and below the station and is about 225 feet wide at ordinary stages. The banks are rocky and are subject to overflow in extreme freshets. The bed is rocky and permanent. The current is rapid.

The gage, which is read twice each day by Jeremiah Durgin, jr., is a vertical rod attached to a large bowlder on the left bank about 700 feet below the cable. It is referred to a bench mark, a copper bolt set in a bowlder 9.5 feet from the gage; elevation, 7.97 feet above the zero of the gage.

No revision has been made in estimates previously published for this station.

Values for monthly means as given below are considered to be within 5 per cent of the true flow for discharge greater than 500 second-feet. Below this point the probable error increases gradually, being about 10 to 15 per cent for a discharge of 170 second-feet. The daily discharges are subject to much larger errors.

Discharge measurements of Dead River near The Forks.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
1901.		
September 29 [a]	0.40	255
1903.		
June 5	.90	399
June 6	.90	401
July 15	1.10	737
August 18	.89	452
November 4	.69	211
Do	.69	214
1904.		
June 8	3.00	3,470
June 9	6.35	15,300
June 21	1.05	655
1904.		
June 21	1.05	676
July 27	.72	279
August 29	.78	370
1905.		
April 21	1.82	1,810
June 1	1.75	1,520
Do	1.75	1,510
July 18	1.09	690
1906.		
May 8	4.35	7,700
Do	4.28	7,490
September 5	.85	385

[a] By wading.

Daily gage height, in feet, of Dead River near The Forks.

Day.	Sept.	Oct.	Nov.	Dec.
1901. [a]				
1		0.35	0.5	0.8
2		.4	.4	.8
3		.4	.5	.7
4		.4	.5	.7
5		.4	.5	.7
6		.35	.45	.8
7		.3	.4	.8
8		.3	.4	.7
9		.3	.4	
10		.3	.4	
11		.3	.4	
12		.3	.4	
13		.4	.45	
14		.5	.5	
15		.8	.5	
16		1.5	.5	
17		1.6	0.5	
18		1.3	.4	
19		.95	.4	
20		.85	.5	
21		.8	.5	
22		.65	.5	
23		.7	.6	
24		.8	.6	
25		.8	.6	
26		.8	.6	
27		.7	.7	
28		.7	.7	
29	0.4	.6	.7	
30	.4	.55	.8	
31		.5		

[a] Ice conditions November 20 to December 31, 1901.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1902. [a]										
1					2.57	2.1	0.8	1.05	2.8	1.0
2					2.1	2.4	.9	1.1	2.65	1.0
3					1.85	2.2	1.0	1.0	2.0	1.0
4					1.55	2.0	1.0	1.0	1.75	1.2
5					1.7	1.9	1.1	1.0	1.6	1.2
6					1.5	1.75	1.0	.9	1.55	1.1
7					1.4	1.55	1.1	1.3	1.45	1.1
8					1.4	1.35	1.0	1.55	1.35	1.0
9					1.3	1.3	.9	1.45	1.25	1.0
10					1.1	1.4	1.0	1.3	1.1	1.0
11					1.0	1.3	1.1	1.2	1.1	1.1
12					.8	1.2	1.45	1.25	1.0	1.2
13					1.2	1.1	1.75	1.45	.9	1.1
14					1.15	1.0	1.8	1.6	.75	1.1
15					1.1	1.0	1.7	1.6	1.1	1.1
16					1.1	1.1	1.6	1.6	1.7	1.1
17					1.1	1.0	1.5	2.0	1.9	1.1
18					1.0	1.1	1.5	1.75	1.8	1.15
19					1.0	1.0	1.6	1.0	1.8	1.2
20					1.0	.9	1.75	1.0	1.65	1.3

[a] 1902 gage heights have been revised to agree with observer's original record. Ice conditions probably existed during December, 1902.

Daily gage height, in feet, of Dead River near The Forks—Continued.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1902.										
21					0.75	0.8	1.9	0.95	1.55	1.4
22					.6	.8	1.8	.9	1.5	1.4
23					.8	.7	1.7	.8	1.45	1.5
24					.7	.7	1.6	.8	1.4	1.5
25				1.6	1.0	1.8	1.6	1.1	1.4	1.5
26				4.55	1.25	1.45	1.45	1.2	1.3	1.45
27				3.05	1.05	1.3	1.25	1.1	1.2	
28				3.3	1.2	1.2	1.1	1.2	1.1	
29				4.15	1.45	1.1	1.1	1.0	1.1	
30				3.2	1.65	1.0	1.1	1.35	1.0	
31					2.0	.7		2.8		
1903.[a]										
1					1.0	1.35	.9	.6	.7	1.0
2					1.0	1.4	.8	.6	.7	1.1
3					1.0	1.4	.8	.6	.7	1.1
4				1.0	1.0	1.3	.7	.6	.7	1.2
5				1.0	.9	1.15	.7	.6	.8	1.1
6				1.0	.9	1.05	.8	.5	.8	1.0
7				.9	.9	1.0	.7	.5	.8	1.0
8				.9	1.0	1.0	.7	.5	.8	1.0
9				.9	.95	.9	.7	.5	.7	1.0
10				.9	.9	.9	.7	.5	.7	1.0
11				1.85	1.0	.9	.7	.5	.8	1.0
12				2.8	1.0	.9	.6	.5	.8	1.0
13				4.8	1.0	.9	.6	.5	.8	.9
14				3.8	1.0	.9	.6	.5	.7	.9
15				2.9	1.1	.9	.6	.5	.7	1.0
16				2.2	1.1	1.0	.6	.6	.7	1.0
17				1.95	1.1	1.0	.6	.6	.75	1.0
18				1.8	1.1	.9	.6	.6	.8	1.0
19				2.0	1.1	.9	.6	.6	.7	1.0
20				2.15	1.0	.9	.6	.6	.7	1.1
21				2.05	1.0	1.0	.6	.6	.8	1.25
22				1.7	1.0	1.1	.6	.6	.8	1.35
23				1.5	1.0	1.3	.6	.6	.8	1.4
24				1.4	.9	1.35	.6	.6	.9	1.5
25				1.3	1.1	1.2	.6	.6	.9	1.6
26				1.1	1.35	1.1	.5	.6	.9	1.6
27				1.0	1.5	1.05	.5	.6	.9	1.7
28				1.0	1.25	1.0	.5	.7	.9	1.85
29				1.1	1.15	1.0	.5	.7	.9	2.0
30				1.1	1.1	.9	.6	.7	1.0	2.1
31					1.2	.9		.7		2.1
1904.[b]										
1			4.15	2.25	1.05	.95	.75	2.15	1.35	.95
2			4.9	2.45	1.2	.95	.75	3.05	1.35	.95
3			5.35	4.15	1.45	.85	.75	3.0	1.35	.95
4			5.9	3.45	1.7	.85	.85	2.7	1.25	1.05
5		4.95	6.85	2.45	1.55	.8	1.25	2.6	1.2	1.05
6			5.25	4.65	1.4	.75	1.45	2.55	1.15	1.15
7			4.55	3.45	1.25	.75	1.3	2.25	1.15	1.15
8			4.45	4.65	1.2	.65	1.2	1.7	1.25	1.15
9			4.15	4.75	1.0	.65	1.05	1.4	1.25	1.25
10		2.85	4.75	4.5	1.0	.65	1.05	1.35	1.25	1.4
11		2.05	5.15	3.75	1.1	.75	.95	1.25	1.2	([c])
12		3.25	4.55	3.45	1.4	.75	.95	1.25	1.15	
13		3.35	4.25	2.6	1.5	.85	1.05	1.15	1.15	
14		3.35	4.05	2.1	1.5	.95	1.25	1.25	1.15	
15		2.35	5.6	1.8	1.3	.95	1.6	1.15	1.05	
16		2.2	4.3	1.5	1.15	.85	1.8	1.15	1.05	
17		1.95	4.6	1.4	1.0	.85	1.7	1.25	1.15	
18		1.8	4.15	1.2	1.05	.85	1.5	1.15	1.15	
19		1.85	6.15	1.05	.95	.85	1.35	1.15	1.05	
20		1.85	5.55	1.05	.95	.75	1.45	1.15	1.05	

[a] Gage carried away during the winter by ice; replaced June 4, 1903. Ice conditions during December, 1903.

[b] River frozen over January 1 to April 5 and December 11-31, 1904; clear of ice April 9. No readings during frozen period.

[c] Anchor ice affects gage readings.

Daily gage height, in feet, of Dead River near The Forks—Continued.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1904.										
21	....	1.85	5.65	1.05	0.95	1.15	1.35	1.7	1.05	....
22	....	1.95	5.45	1.1	.95	1.65	1.35	2.15	1.05	....
23	....	2.05	4.8	1.15	.85	1.7	1.35	2.55	1.05	....
24	....	2.35	4.65	1.2	.85	1.5	1.25	2.75	1.05	....
25	....	2.5	2.85	1.35	.75	1.05	1.25	2.6	1.05	....
26	....	3.3	3.05	1.45	.75	.9	1.4	2.4	1.05	....
27	....	3.0	5.4	1.45	.65	.8	1.6	1.85	.95	....
28	....	3.85	2.9	1.35	.65	.75	1.65	1.65	1.0	....
29	....	6.05	4.85	1.2	.75	.75	1.75	1.5	1.0	....
30	....	4.45	2.75	1.1	.85	.75	1.85	1.4	.95	....
31	....	....	1.95	....	.95	.75	....	1.35	....	....
1905.[a]										
1	....	3.6	3.9	2.6	1.75	1.85	.75	.75	.75	1.15
2	....	3.35	4.15	2.55	2.2	1.85	.75	.75	.85	1.1
3	....	3.4	3.55	1.9	2.3	1.55	.75	.75	.85	1.05
4	....	2.9	5.85	1.7	2.4	1.4	.85	.75	.85	1.05
5	....	2.6	4.25	1.65	2.2	1.2	.95	.75	.85	1.15
6	....	2.45	4.05	1.65	2.0	1.0	1.05	.75	.85	1.15
7	....	2.35	4.2	1.75	1.8	1.0	1.2	.75	.85	1.15
8	....	2.35	4.25	1.65	1.6	1.05	1.25	.65	.95	1.15
9	....	2.35	4.15	1.6	1.5	1.05	1.1	.65	.95	1.15
10	....	2.45	4.3	1.55	1.45	1.05	.95	.65	.95	1.15
11	....	2.45	4.55	1.55	1.35	1.05	.95	.65	.85	1.15
12	....	2.65	4.15	1.8	1.45	.95	.85	.65	.75	1.05
13	....	2.5	4.1	2.3	1.3	.95	.75	.65	.75	1.05
14	....	2.3	3.8	2.2	1.2	1.05	.75	.65	.85	1.05
15	....	2.35	3.5	1.95	1.1	1.05	.75	.75	.85	1.05
16	....	2.35	5.7	1.85	1.05	1.15	.75	.75	.85	1.05
17	....	2.95	5.05	1.85	1.0	1.3	.75	.75	.85	....
18	....	2.85	4.05	1.75	1.05	1.45	.9	.75	.95	....
19	....	2.2	3.8	2.0	1.25	1.3	1.1	.75	.95	....
20	....	1.9	5.2	2.3	1.65	1.15	1.15	.75	.95	....
21	....	2.4	5.1	2.65	1.95	1.15	1.05	.75	.95	....
22	....	3.25	4.85	2.65	1.35	1.05	.95	.75	.85	....
23	....	4.95	4.65	2.4	1.1	1.05	.95	.75	.85	....
24	....	2.35	4.75	2.2	1.1	1.05	.95	.75	.85	....
25	....	2.3	4.6	2.05	1.15	.95	.9	.75	.85	....
26	....	2.15	5.15	2.05	1.15	.95	.8	.75	.95	....
27	....	2.3	4.35	1.95	1.05	.85	.75	.75	.95	....
28	4.85	3.2	4.45	1.95	.95	.85	.75	.75	1.05	....
29	3.85	3.4	4.55	1.85	.95	.85	.75	.65	1.15	....
30	2.8	3.15	4.15	1.75	.95	.75	.75	.65	1.15	....
31	3.5	....	2.85	....	1.5	.75	....	.65	....	....
1906.[b]										
1	....	....	3.85	3.55	1.25	.85	.75	.75	1.4	.95
2	....	....	4.4	2.35	1.15	.85	.85	.75	1.3	.95
3	....	....	4.1	2.15	1.15	.75	.85	.75	1.25	1.05
4	....	....	4.2	1.95	1.15	.75	.8	.75	1.15	1.05
5	....	....	3.7	2.95	1.15	.75	.75	.75	1.05	1.05
6	....	....	4.35	3.05	1.15	.75	.75	.65	1.05	1.15
7	....	....	4.35	3.7	1.05	.75	.75	.65	.95	1.25
8	....	....	3.65	3.95	1.05	.65	.75	.65	.95	1.25
9	....	....	3.85	3.7	1.05	.65	.75	1.15	.95	1.25
10	....	2.65	3.9	2.7	1.2	.65	.75	1.4	.95	1.15
11	....	2.65	4.25	3.6	1.3	.65	.85	1.65	1.05	1.25
12	....	2.55	4.75	3.95	1.65	.65	.85	1.55	1.05	1.25
13	....	2.45	3.95	2.5	1.8	.65	.8	1.65	.95	1.25
14	....	2.45	4.05	2.0	1.65	.65	.75	1.3	.95	....
15	....	2.35	3.8	1.95	1.6	.65	.75	1.25	1.05	....
16	....	2.6	3.85	1.6	1.35	.65	.75	1.15	1.05	....
17	....	3.0	3.85	1.7	1.35	.6	.75	.95	1.05	....
18	....	3.2	4.35	1.55	1.35	.55	.75	.95	1.05	....
19	....	3.4	3.9	1.45	1.35	.65	.75	.9	1.05	....
20	....	3.6	3.65	1.4	1.25	.65	.75	.85	1.05	....

[a] River frozen January 1 to March 27, 1905; ice went out March 28 and river clear. River frozen December 16–31, 1905.
[b] River frozen January 1 to April 10, and December 14–31, 1906.

Daily gage height, in feet, of Dead River near The Forks—Continued.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1906.										
21	....	3.85	3.85	1.35	1.25	.75	.75	.85	1.15	....
22	....	4.55	3.4	1.25	1.25	.75	.75	1.25	1.25	....
23	....	4.65	4.0	1.5	1.25	.75	.75	1.5	1.35	....
24	....	4.15	3.4	1.65	1.25	.85	.85	1.8	1.25	....
25	....	3.8	3.55	2.0	1.15	.85	.85	1.85	1.15	....
26	....	3.4	2.6	1.9	1.15	.85	.75	1.95	1.15	....
27	....	3.0	3.0	1.8	1.05	.75	.75	2.05	1.15	....
28	....	3.25	3.05	1.6	.95	.75	.75	1.9	1.05	....
29	....	3.55	3.95	1.4	.95	.75	.75	1.85	1.05	....
30	....	3.45	3.25	1.35	.85	.75	.65	1.7	1.05	....
31	....	....	3.15	....	.85	.75	....	1.55	....	....

Rating table for Dead River near The Forks from June 25, 1902, to December 31, 1906.[a]

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.40	45	1.50	1,225	2.60	2,970	4.40	7,730
0.50	110	1.60	1,365	2.70	3,160	4.60	8,420
0.60	185	1.70	1,505	2.80	3,360	4.80	9,140
0.70	270	1.80	1,650	2.90	3,570	5.00	9,890
0.80	365	1.90	1,795	3.00	3,790	5.50	11,920
0.90	470	2.00	1,945	3.20	4,240	6.00	14,080
1.00	580	2.10	2,100	3.40	4,730	6.50	16,370
1.10	700	2.20	2,260	3.60	5,260	7.00	18,780
1.20	825	2.30	2,430	3.80	5,830		
1.30	955	2.40	2,600	4.00	6,430		
1.40	1,090	2.50	2,780	4.20	7,060		

[a] This table is applicable only for open-channel conditions. It is based on 19 discharge measurements made during 1903–1906. It is well defined between gage heights 0.7 foot and 2 feet.

Monthly discharge of Dead River near The Forks.

[Drainage area, 870 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1902.[a]					
June 25–30	8,245	1,365	4,855	5.58	1.22
July	2,913	185	954	1.09	1.26
August	2,600	270	991	1.14	1.31
September	1,795	365	1,022	1.17	1.30
October	3,360	365	942	1.08	1.24
November	3,360	318	1,226	1.41	1.57
1903.					
June 4–30	9,140	470	1,748	2.01	2.02
July	1,225	470	646	.743	.86
August	1,090	470	648	.745	.86
September	470	110	222	.255	.28
October	270	110	172	.198	.23
November	580	270	357	.410	.46
1904.[b]					
April 10–30	14,300	1,650	3,722	4.28	3.34
May	18,040	1,870	8,892	10.22	11.78
June	8,960	640	2,969	3.41	3.80
July	1,505	228	705	.810	.93
August	1,505	228	495	.569	.66
September	1,722	318	967	1.11	1.24
October	3,900	762	1,770	2.03	2.34
November	1,022	525	741	.852	.95
December 1–10	1,090	525	712	.818	.30

[a] Estimates for December, 1902, and December, 1903, omitted on account of ice conditions.
[b] River frozen January 1 to April 9 and December 11–31, 1904.

Monthly discharge of Dead River near The Forks—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.[a]					
April	9,700	1,795	3,352	3.85	4.30
May	13,420	3,465	7,821	8.99	10.36
June	3,065	1,295	1,955	2.25	2.51
July	2,600	525	1,180	1.36	1.57
August	1,722	318	739	.849	.98
September	890	318	475	.546	.61
October	318	228	289	.332	.38
November	762	318	470	.540	.60
December 1-16	762	640	705	.810	.48
1906.[b]					
April 10-30	8,600	2,515	4,586	5.27	4.12
May	8,960	2,970	5,936	6.82	7.86
June	6,280	890	2,593	2.98	3.32
July	1,650	418	867	.997	1.15
August	418	148	292	.336	.39
September	417	227	337	.387	.43
October	2,022	227	934	1.07	1.23
November	1,090	525	701	.806	.90
December 1-13	890	525	756	.869	.42

[a] River frozen January 1 to March 28 and December 16-31, 1905.
[b] Ice conditions January 1 to April 10 and December 14-31, 1906.

CARRABASSETT RIVER AT NORTH ANSON.

Carrabassett River enters the Kennebec from the west at North Anson. Its basin has steep slopes, partly in farm lands, with no large natural reservoirs. Dams have been constructed and power used at New Portland, East New Portland, and North Anson.

The gaging station was established October 19, 1901, by N. C. Grover. It is located above Embden Brook and below Anson Brook, about 4 miles from North Anson.

The channel is straight for 500 feet above and 300 feet below the station and is about 150 feet wide, divided into two parts at low stages of the river by a gravelly bar. The bed is of coarse gravel and is permanent, and the current is moderately rapid.

Discharge measurements are made by wading at low stages and from a boat at high stages.

Gage readings are taken once each day by N. Q. Hilton. There are two gages. One is a vertical rod attached to a tree; the other is a standard chain gage attached to trees on the bank. The length of the chain is 36.73 feet. The datum of the two gages is the same and is referred to a bench mark, a copper bolt set in a large bowlder at the outlet of Anson Brook; elevation, 11.40 feet above the zero of the gage.

Estimates as previously published for 1902 to 1904, inclusive, have been revised and are now based on the 1905 rating curve.

Values for monthly means, as given below, are considered to be within 5 per cent of the true flow for discharges greater than 600 second-feet. Below this point the error may range between 5 and 30 per cent. This is due to changing conditions of flow and the larger errors in general occur only over relatively short periods of time. The probable error of a given low monthly flow can be estimated somewhat closely by comparing the percentage error of the nearest low-water measurement, in point of time, with the rating table for the gage height of the measurement.

Discharge measurements of Carrabassett River at North Anson.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1902.	*Feet.*	*Sec.-ft.*	1903.	*Feet.*	*Sec.-ft.*
June 27	4.30	4,170	August 15	0.71	300
July 30	.60	192	September 23	.15	76
October 30	2.47	1,810	November 6	.30	165
October 30	2.67	2,120			
October 31	1.99	1,370	1904.		
November 1	1.69	1,130	August 30	.40	154
November 1	1.60	1,080			
November 2	1.42	882	1905.		
November 3	1.35	851	July 20 [a]	1.18	436
			October 26 [b]	.40	146
1903.					
May 26	.45	208	1906.		
July 17	.90	348	September 7	.06	107

[a] Log jam in left channel 500 feet below gage. [b] Measurement made by wading near gage.

Daily gage height, in feet, of Carrabassett River at North Anson.

Day.	Nov.	Dec.	Day.	Nov.	Dec.
1		0.6	16	0.2	
2		.6	17	.2	
3	0.4	.6	18	.2	
4	.4	.5	19	.5	
5	.4	.5	20	.4	
6	.3	.5	21	.3	
7	.3	([a])	22	.2	
8	.3		23	.2	
9	.3		24	.2	
10	.3		25	.2	
11	.3		26	.2	
12	.2		27	.2	
13	.2		28	.2	
14	.2		29	.2	
15	.2		30	.1	

[a] River frozen December 7 to 31, 1901.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1902. [a]										
1					1.4	0.4	0.7	0.9	1.7	1.0
2					1.8	.4	.8	1.1	1.5	1.0
3					1.6	1.5	.7	1.0	1.4	.9
4					1.5	1.2	.7	.9	1.3	1.0
5					1.3	1.0	.9	.8	1.2	1.1
6					1.1	.9	.8	1.2	1.1	1.1
7					1.0	.8	.7	1.7	1.1	1.2
8					.9	.8	.9	1.3	1.1	1.2
9					.8	.8	.8	1.1	1.1	1.1
10					.8	.8	2.8	1.1	1.0	1.1
11					.9	.7	1.9	1.0	1.0	1.1
12					.7	.9	1.4	.9	1.0	.9
13					.7	.9	1.2	.9	1.1	
14					.6	.7	2.8	.9	1.1	
15					.6	.6	2.1	1.0	1.4	

[a] River frozen December 13-31, 1902.

Daily gage height, in feet, of Carrabassett River at North Anson—Continued.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1902.										
16					0.6	0.5	1.6	0.9	1.5	
17					.6	.5	1.3	.8	1.5	
18					.6	.5	1.1	.8	1.3	
19					.5	.5	1.0	.8	1.2	
20					.6	.3	1.4	1.4	1.2	
21					.6	.3	1.3	1.6	1.2	
22					1.0	.3	1.1	1.3	1.1	
23					1.0	6.4	1.0	1.1	1.2	
24					.8	3.6	1.1	1.1	1.1	
25					.8	2.3	.9	.9	1.1	
26				4.8	.7	1.6	.8	1.0	1.0	
27				4.9	.6	1.4	.8	.9	1.0	
28				3.1	.6	1.1	.8	1.5	1.1	
29				2.2	.6	1.0	1.0	4.3	1.0	
30				1.7	.5	.8	1.0	2.5	1.0	
31					.5	.7		2.0		
1903.[a]										
1		2.9	1.9	0.2	.5	1.4	.4	.2	.3	0.4
2		2.5	1.9	.1	.6	1.0	.4	.1	.3	.3
3		2.2	1.3	.2	.8	.8	.4	.1	.3	.3
4		3.7	1.3	.2	.6	.7	.4	.1	.3	.3
5		4.0	1.2	.2	.5	.6	.3	.2	.2	.3
6		2.7	1.2	.2	.5	.5	.5	.5	.3	.4
7		2.3	1.2	.1	.5	.6	.3	.5	.4	.3
8		2.2	1.3	.1	.5	.5	.3	.4	.4	.4
9		3.5	1.2	.1	.5	.5	.3	.4	.3	.4
10		3.6	1.2	.1	.6	.5	.2	.6	.4	.5
11		3.3	1.3	.1	.5	.4	.3	.5	.3	.5
12		2.6	1.2	.1	.6	1.7	.2	.4	.4	.5
13		2.4	1.1	11.1	.6	1.2	.3	.4	.4	.6
14		2.2	1.0	8.3	.6	.9	.3	.5	.3	.6
15		2.2	1.0	4.1	.4	.7	.3	.4	.2	.6
16		2.2	.9	2.8	1.2	.5	.2	.4	.3	.8
17		2.1	.7	2.1	.9	.6	.3	.4	.3	.7
18		1.9	.7	1.8	.7	.6	.3	.7	.4	.8
19		1.7	.7	1.5	.5	.5	.3	1.3	.5	1.0
20		1.7	.7	1.8	.7	.6	.2	.8	.4	.9
21		1.6	.9	1.6	.7	1.6	.2	.7	.3	2.6
22		1.5	.7	1.4	1.4	1.1	.2	.6	.4	2.6
23		1.5	.6	1.2	1.2	.9	.2	.5	.4	2.5
24		1.5	.5	1.0	2.9	.7	.1	.5	.3	2.4
25		1.5	.5	.9	2.0	.6	.1	.5	.8	2.3
26		1.5	.5	.9	1.5	.6	.1	.5	1.1	2.3
27		1.4	.4	.8	1.1	.6	.1	.5	.5	2.4
28		1.5	.4	.7	.9	.6	.2	.4	.4	2.3
29		1.7	.4	.6	.8	.5	.3	.5	.3	2.3
30	2.1	1.9	.2	.6	1.0	.4	.3	.4	.3	2.0
31	2.4		.2		1.7	.4		.3		2.0
1904.										
1			7.3	.9	.4	.7	.3	2.1	1.1	.8
2			4.9	.9	.8	.7	.3	1.8	1.1	.8
3			4.0	.8	1.0	.6	.3	1.4	1.0	1.0
4	[b]1.9		4.2	.8	.9	.5	.5	1.2	1.0	1.1
5			4.4	.8	.6	.4	.7	1.0	1.0	.9
6			3.7	1.1	.6	.4	.5	.9	.8	.8
7			3.8	2.3	.7	.4	.4	.9	.8	1.0
8			2.6	1.8	.5	.4	.4	.8	.8	.8
9			2.4	1.5	.4	.4	.3	.8	.7	.7
10		4.7	9.5	1.3	.3	.4	.3	.8	.8	.7
11		5.2	5.8	1.1	.3	.6	.3	.7	.8	.7
12		4.1	4.6	.9	2.3	1.3	.3	.7	.8	.7
13		3.3	3.5	.8	1.5	1.2	.4	.7	.6	.6
14		2.7	2.9	.7	1.9	.9	.3	.8	.7	.7
15		2.2	2.4	.6	1.4	.9	.9	.8	.9	.6

[a] River frozen January 1 to March 29 and December 31, 1903.
[b] Gage reading to water surface in hole cut in ice at gage; otherwise no readings during frozen season, 1904.

Daily gage height, in feet, of Carrabassett River at North Anson—Continued.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1904.										
16		1.9	11.3	0.5	1.1	0.8	1.9	0.8	0.8	0.7
17		1.6	6.6	.5	.8	.7	1.3	.7	.7	.7
18		1.7	4.1	.5	.7	.6	1.0	.7	.8	.6
19		1.8	3.3	.4	.5	.5	.9	.7	.9	.7
20		2.8	4.4	.4	.4	.4	.9	.6	.9	.7
21		2.5	3.1	.3	.4	2.7	.9	.6	.7	.7
22		2.3	2.5	.3	.3	1.6	.9	.4	1.2	.7
23		2.5	2.2	.5	.3	1.3	.8	2.5	.9	.8
24		3.2	2.0	.5	.2	1.0	.7	1.9	.8	.8
25		3.9	1.7	.4	.3	.8	.5	1.6	.9	.8
26		3.4	1.6	.6	.3	.7	.4	1.4	1.0	.7
27		3.7	1.5	.4	.2	.5	.4	1.9	.9	.8
28		3.4	1.4	.3	.9	.5	.4	1.6	.7	.9
29		4.7	1.3	.1	1.8	.5	.7	1.5	.8	.9
30		7.1	1.2	.2	1.4	.4	2.8	1.3	.8	.9
31			1.0		.9	.4		1.2		.9
1905.[a]										
1		3.0	2.3	1.0	.9	2.9	.3	.4	.4	1.0
2		2.8	2.0	.9	.9	1.5	.3	.4	.6	1.1
3		2.3	1.4	.9	2.7	1.2	.3	.4	.6	.7
4		2.1	3.6	1.0	1.9	.9	2.2	.4	.6	1.1
5		1.9	3.1	.8	1.5	.7	1.4	.4	.7	1.4
6		4.0	2.6	.8	1.2	.7	1.9	.4	.7	1.2
7		3.6	2.6	1.0	1.0	.6	1.4	.4	.8	.9
8		2.7	2.5	.8	.9	.9	1.2	.3	1.0	1.0
9		2.2	2.0	.7	.8	.8	1.0	.4	.8	.8
10		2.2	2.1	.7	.8	.7	.8	.4	.8	.8
11		2.9	1.7	.6	.8	.6	.7	.3	.6	.8
12		2.7	1.5	.7	.7	.5	.6	.3	.7	.6
13		2.8	1.5	3.8	.6	.5	.7	1.0	.8	.6
14		2.7	1.6	2.4	.5	.7	.8	.9	.8	.7
15		2.8	1.5	1.8	.5	.5	.7	.7	.8	.8
16		2.4	1.6	1.5	.5	.6	.6	.6	.7	.8
17		2.0	2.0	1.3	.5	.9	.6	.5	.8	.8
18		1.8	2.2	1.1	.6	.7	.8	.4	1.0	1.0
19		1.6	3.0	1.4	1.2	.6	1.7	.4	.7	.7
20		1.4	2.5	1.7	1.2	.5	1.3	.4	.7	.6
21		1.3	1.9	1.8	.9	.5	1.3	.5	.8	.6
22		3.4	1.7	1.5	.7	.4	1.1	.6	.7	.8
23		2.6	1.5	1.4	.6	.4	1.0	.6	.5	.7
24		2.1	1.3	1.2	.5	.3	1.0	.6	.6	.7
25		2.0	1.2	1.0	.7	.2	.7	.5	.6	1.0
26		1.9	1.1	.9	.5	.3	.6	.6	1.1	.8
27		2.2	1.3	1.8	.4	.3	.7	.6	1.0	.8
28		1.9	1.5	1.5	.7	.5	.5	.4	1.0	.7
29	4.0	2.1	1.3	1.2	.4	.4	.5	.4	.7	.7
30		2.0	1.2	1.0	.3	.3	.5	.4	1.0	.7
31			1.1		1.3	.3		.4		.8
1906.[b]										
1		2.9	3.0	1.5	.5	1.1	.3	.1	.9	.9
2		2.7	4.0	1.4	.5	1.0	.2	0	.8	.4
3		2.4	3.5	1.7	.6	.7	.3	0	.8	.9
4		2.3	3.8	1.7	.6	.5	.6	.2	.8	1.1
5		2.5	3.5	1.4	.7	.4	.5	.2	.7	1.3
6		3.0	3.1	1.3	.7	.4	.3	.3	.7	1.4
7		3.3	3.2	2.0	.9	.3	.1	.4	.6	1.4
8		2.9	2.8	1.9	.7	.2	.1	.2	.7	1.5
9		2.8	2.3	1.8	.6	.1	.1	.5	.5	1.3
10		2.9	4.1	1.8	.9	.2	.2	4.0	.5	1.1
11		2.7	3.6	1.4	.8	.1	.4	3.1	.6	1.0
12		2.5	2.7	1.2	1.6	.1	.2	2.2	.6	.9
13		2.4	2.3	1.3	1.2	.1	.1	1.5	.6	1.0
14		2.3	2.6	1.1	1.0	0	0	1.1	.6	.9
15		3.0	1.9	.8	.8	.2	.1	.9	.5	.9

[a] River frozen January 1 to March 26, 1905; ice broke up March 26 and went out March 28.
[b] River frozen January 1 to April 16, 1906, when the ice broke up; ice went out April 18, 1906.

Daily gage height, in feet, of Carrabassett River at North Anson—Continued.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1906.										
16	....	5.1	1.8	0.7	0.6	0	−0.1	0.8	0.6	0.9
17	....	5.5	1.8	.6	.5	0	− .1	.7	.7	.9
18	....	5.1	2.2	.6	.5	0	0	.5	.6	.9
19	....	4.8	2.2	.7	.7	0	0	.5	.7	1.0
20	....	4.8	2.1	.6	.5	0	0	.6	1.4	1.0
21	....	4.8	1.5	.6	.4	0	0	.8	1.2	1.1
22	....	4.9	1.4	.3	.9	.5	− .1	.7	1.2	1.4
23	....	5.1	1.3	.4	.7	.3	0	.8	1.2	1.8
24	....	3.4	1.3	2.3	1.3	.3	.1	.7	1.1	2.1
25	....	2.8	1.3	1.8	1.0	.3	0	.7	1.1	1.9
26	....	2.7	1.8	1.3	.7	.2	− .1	3.5	1.1	1.9
27	....	2.6	1.8	1.2	.6	.1	0	2.4	.9	1.8
28	....	2.5	3.2	.7	.4	1.7	0	2.2	.8	1.8
29	....	2.8	3.0	.6	.4	.9	0	2.1	1.0	1.8
30	....	3.3	2.3	.6	.3	.5	0	1.6	.6	1.7
31	....	....	1.8	....	1.7	.4	....	1.1	....	1.5

Rating tables for Carrabassett River at North Anson.

NOVEMBER 3, 1901, TO DECEMBER 31, 1905.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.10	55	1.30	755	2.50	1,900	3.70	3,345
0.20	85	1.40	840	2.60	2,010	3.80	3,480
0.30	120	1.50	925	2.70	2,120	3.90	3,615
0.40	160	1.60	1,015	2.80	2,235	4.00	3,750
0.50	205	1.70	1,105	2.90	2,350	5.00	5,100
0.60	256	1.80	1,195	3.00	2,470	6.00	6,450
0.70	313	1.90	1,290	3.10	2,590	7.00	7,800
0.80	376	2.00	1,385	3.20	2,710	8.00	9,150
0.90	445	2.10	1,485	3.30	2,830	9.00	10,500
1.00	520	2.20	1,585	3.40	2,955	10.00	11,850
1.10	595	2.30	1,690	3.50	3,080	11.00	13,200
1.20	675	2.40	1,795	3.60	3,210		

JANUARY 1 TO DECEMBER 31, 1906.[b]

−.10	77	0.20	133	0.50	233	0.80	395
0.00	92	0.30	160	0.60	280	0.90	455
0.10	110	0.40	193	0.70	335	1.00	520

[a] This table is applicable only for open-channel conditions. It is based on 14 discharge measurements made during 1902–1905. It is well defined below gage height 5.0 feet. Above gage height 3.6 feet the rating curve is a tangent, the difference being 135 per tenth.

[b] This table is applicable only for open-channel conditions. The rating is the same as the 1905 rating above gage height 1 foot. Below 1 foot it is based primarily on the measurement made in 1906, and probably represents closely the conditions of flow as they existed during that year.

Monthly discharge of Carrabassett River at North Anson.

[Drainage area, 340 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1902.[a]					
June 26-30	4,965	1,105	3,015	8.87	1.65
July	1,295	205	435	1.28	1.48
August	6,990	120	738	2.17	2.50
September	2,235	313	694	2.04	2.28
October	4,155	376	762	2.24	2.58
November	1,105	520	668	1.96	2.19
December 1-12	675	445	565	1.66	.74
1903.[b]					
April	3,750	840	1,693	4.98	5.56
May	1,290	85	492	1.45	1.67
June	13,340	55	1,332	3.92	4.37
July	2,350	160	483	1.42	1.64
August	1,105	160	360	1.06	1.22
September	205	55	110	.324	.36
October	755	55	200	.588	.68
November	595	85	161	.474	.53
December [c]	2,010	120	764	2.25	2.59
1904.[d]					
April 10-30	7,935	1,015	2,911	8.56	6.68
May	13,670	520	3,556	10.46	12.06
June	1,690	55	395	1.16	1.29
July	1,690	85	425	1.25	1.44
August	2,120	160	386	1.14	1.31
September	2,235	120	362	1.06	1.18
October	1,900	160	652	1.92	2.21
November	675	256	419	1.23	1.37
December	595	256	367	1.08	1.24
1905.[e]					
April	3,750	755	1,814	5.34	5.96
May	3,210	595	1,316	3.87	4.46
June	3,480	256	789	2.32	2.59
July	2,120	120	459	1.35	1.56
August	2,350	120	343	1.01	1.16
September	1,585	120	490	1.44	1.61
October	520	120	205	.602	.69
November	595	160	354	1.04	1.16
December	840	256	404	1.19	1.37
1906.[f]					
April	5,775	1,690	2,976	8.75	9.76
May	3,885	755	1,962	5.77	6.65
June	1,690	160	708	2.08	2.32
July	1,105	160	389	1.14	1.31
August	1,105	92	215	.632	.73
September	280	77	119	.350	.39
October	3,750	92	774	2.28	2.63
November	840	233	408	1.20	1.34
December	1,485	193	759	2.23	2.57

[a] River frozen December 13-31, 1902.
[b] River frozen January 1 to March 29 and December 31, 1903.
[c] No correction made for ice conditions December 31, 1903.
[d] River frozen January 1 to April 9, 1904.
[e] River frozen January 1 to March 26, 1905.
[f] River frozen January 1 to April 16, 1906; open-channel rating applied for first half of April which gives excessive values for that month.

SANDY RIVER NEAR MADISON.

Sandy River rises near Rangeley Lake, flowing at first southeastward, then in the last third of its course northeastward into Kennebec River, which it joins about 2 miles below Madison. It has a total length of about 50 miles, and while there are a few small ponds in its basin its storage capacity is small and the flow is variable. It resembles very much in this way Carrabassett River, the slopes being in the main steep and the fall very rapid throughout the greater part of its course, amounting in all to as much as 1,400 feet. Comparatively few water-power developments have been made; namely, at New Sharon, Farmington, and at the point near Madison described below.

This station was established March 23, 1904, by F. E. Pressey. It is located at the dam of the Madison Electric Works, just over the town line in Stark, but is nearer the Madison post-office. The dam rests on ledge rock and has a fairly level crest, 341.4 feet in length between vertical abutments. The crest is 1 foot wide on top, sloping from the upstream edge 4.75 horizontal to 1.25 vertical, while the downstream face of the dam is vertical. The level top is of dressed stone (6-cut); the remainder is quarry faced, but care has been taken to leave no considerable projection on the approach to the crest. Provision has been made for the installation of flashboards when necessary. The head developed by the dam is about 15 feet, which is used in a power development on the right bank, consisting of a head bay nearly 100 feet long, decreasing in width from 40 to 20 feet at the racks, and one pair of 38-inch McCormick turbines (rated at Holyoke), with complete arrangements for a second pair if found necessary. This plant is owned by the Madison village corporation and is used for furnishing light and power. The pondage extends back about 2 miles, but there is no side flowage. When water is more than 3 feet deep on the dam, the crest is increased in length about 87.5 feet by flowing over the wall of the fore bay. The wheels and generators are in operation only during the night, so that the discharge has been based on a gage height read late in the afternoon just before starting up; and it is believed that the pondage effect has been wholly eliminated in this way.

A plain vertical staff gage was first fastened to the retaining wall of the dam, the elevation of the 100-foot mark at the gage being equal to the elevation of the crest of the dam. This has been superseded, however, by a float gage referred to the same datum and installed through the courtesy and assistance of C. S. Humphreys, C. E., of Madison, engineer in charge. At the same time another float gage was placed to record the height of water in the tailrace, so that in case it becomes necessary to use turbines in estimating flow records of the head on the wheels may be obtained. The gages are referred to the following bench mark: A point inclosed by a circle on the north side of the wing wall, about 22.8 feet from its end at the dam, marked "B. M."; elevation 102.98 feet above gage datum. The gages are read twice daily by Marcus W. Moore, electrician at the station.

Where the discharge is under about 500 second-feet, values may be in error from 10 to 25 per cent; above 500 second-feet discharge, error is probably under 10 per cent.

Daily discharge, in second-feet, of Sandy River near Madison.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1904.												
1	......	......	......	2,677	9,255	516	334	235	126	1,137	477	357
2	......	......	......	2,216	5,785	452	289	357	126	720	440	379
3	......	......	......	2,216	4,336	452	516	334	92	502	440	379
4	......	......	......	1,986	4,063	452	452	312	106	502	403	440
5	......	......	......	2,216	3,280	391	334	135	126	379	379	379
6	......	......	......	3,792	2,331	452	235	135	152	306	357	379
7	......	......	......	4,199	1,441	1,064	235	213	106	256	322	379
8	......	......	......	3,531	2,331	974	181	135	79	278	323	323
9	......	......	......	8,875	2,101	735	235	135	92	403	323	357
10	......	......	......	11,265	8,499	585	235	135	92	224	300	357
11	......	......	......	8,126	8,687	452	181	135	60	278	300	357
12	......	......	......	5,936	5,485	334	235	391	60	224	278	323
13	......	......	......	4,199	3,056	391	235	213	42	256	256	300
14	......	......	......	3,056	2,331	391	235	256	79	300	379	323
15	......	......	......	2,446	1,986	452	289	312	379	323	379	224
16	......	......	......	2,101	10,325	334	289	235	1,101	323	477	224
17	......	......	......	1,757	5,785	289	235	181	645	224	570	170
18	......	......	......	2,331	3,280	289	235	181	379	224	440	224
19	......	......	......	2,677	4,609	235	235	181	306	224	403	170
20	......	......	......	4,609	6,402	135	235	135	323	224	379	224
21	......	......	......	3,792	3,531	135	181	1,871	323	300	403	192
22	......	......	......	3,926	2,446	135	181	923	379	4,309	675	278
23	......	......	890	4,609	1,871	135	181	615	300	1,561	645	224
24	......	......	1,250	5,485	1,648	135	181	477	256	923	615	278
25	......	......	1,871	7,411	1,441	66	181	357	256	720	502	323
26	......	......	3,659	6,402	974	135	135	357	357	720	570	323
27	......	......	5,335	6,725	974	135	66	289	300	1,518	440	278
28	......	......	3,792	6,090	812	135	135	135	300	1,137	379	278
29	......	......	2,677	10,850	812	135	135	256	300	675	224	300
30	......	......	2,331	10,237	585	135	152	152	956	615	224	300
31	......	......	2,331	......	516	......	289	192	......	502	......	224
1905.												
1	224	379	*a* 150	7,026	1,364	477	323	2,078	136	57	49	352
2	224	525	*b* 253	4,036	1,325	440	379	645	42	79	60	287
3	256	570	*b* 253	3,012	874	502	2,653	502	51	47	88	483
4	323	570	*b* 200	2,653	2,538	502	956	323	362	51	94	898
5	403	645	*b* 215	2,308	2,607	403	645	224	929	59	134	639
6	502	502	*b* 185	4,581	1,691	403	570	170	1,308	43	144	516
7	502	502	*b* 253	4,775	1,734	615	403	170	836	47	235	455
8	525	502	*b* 149	3,155	1,848	477	300	170	428	41	307	362
9	645	379	*a* 112	2,423	1,561	379	256	192	285	41	284	295
10	675	323	*c* 128	2,469	1,757	323	224	170	109	42	264	296
11	766	278	*c* 168	3,031	1,364	224	170	92	145	37	242	165
12	766	300	*c* 208	2,892	1,137	403	170	106	119	48	212	182
13	645	224	*c* 242	2,940	992	3,330	170	106	163	253	241	231
14	720	256	*c* 302	2,538	956	1,734	152	79	229	339	328	220
15	570	323	*c* 284	2,653	956	956	152	126	166	153	209	210
16	570	323	*c* 242	2,078	1,137	675	126	192	106	150	263	263
17	570	256	*c* 208	1,734	1,848	477	126	300	76	131	352	340
18	556	224	*c* 168	1,325	2,078	403	126	357	318	92	221	373
19	542	278	192	1,137	2,892	357	106	170	1,601	92	114	352
20	528	278	357	1,046	1,917	357	106	106	806	87	183	351
21	514	*a* 139	440	1,175	1,479	403	126	106	563	94	165	351
22	502	*a* 162	956	4,718	1,137	525	79	106	502	135	158	340
23	525	*a* 128	956	2,377	956	477	79	79	417	116	129	274
24	403	*a* 150	797	1,734	797	403	79	79	166	93	131	241
25	379	*a* 139	874	1,518	645	278	79	60	156	92	318	252
26	357	*a* 146	2,940	1,421	675	323	79	60	115	80	388	218
27	379	*a* 112	5,665	1,561	645	1,691	79	00	103	69	362	262
28	323	*a* 162	5,545	1,561	874	1,046	60	42	92	62	183	217
29	256	......	7,479	1,561	615	675	79	42	94	51	241	200
30	224	......	6,694	1,287	477	477	60	42	82	47	339	275
31	874	......	7,908	......	525	......	126	42	......	45	......	241

a Water flowing over one-half of dam on account of obstruction by ice.
b Water flowing over one-third of dam on account of obstruction by ice.
c Water flowing over three-fourths of dam on account of obstruction by ice.

Daily discharge, in second-feet, of Sandy River near Madison—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1906.												
1	231	539	593	1,223	2,458	2,478	......	......	......	......	244	396
2	231	467	595	1,292	2,761	2,353	......	......	......	......	266	194
3	200	374	517	1,050	2,252	3,747	......	......	......	......	312	246
4	229	372	363	1,141	2,252	3,203	......	......	......	......	397	339
5	263	361	444	1,711	1,609	2,312	......	......	......	......	322	304
6	286	407	360	2,882	2,974	2,166	......	......	......	......	243	279
7	236	491	339	2,985	2,901	3,219	......	......	......	......	206	359
8	286	595	326	2,243	2,741	2,994	......	......	......	......	213	373
9	373	555	303	2,371	2,607	3,331	......	......	......	......	213	393
10	429	564	321	2,280	4,050	2,788	......	......	......	346	256	270
11	304	478	182	1,727	3,584	2,520	......	......	......	933	329	304
12	351	565	294	1,748	2,780	2,067	......	......	......	516	295	304
13	339	698	229	1,862	2,576	1,536	......	......	......	310	311	339
14	294	582	406	2,813	2,830	1,202	......	......	......	216	334	304
15	229	442	453	6,018	2,124	906	......	......	......	140	300	281
16	317	373	384	8,844	1,757	688	......	......	......	127	300	324
17	491	296	320	8,497	1,629	656	......	......	......	113	369	259
18	555	208	222	7,304	1,902	601	......	......	......	99	381	282
19	530	274	252	6,312	2,246	601	......	......	......	91	492	271
20	469	273	262	5,972	1,720	594	......	......	......	108	983	222
21	418	274	192	4,954	1,502	497	......	......	......	204	919	260
22	406	294	183	5,791	1,174	638	......	......	......	264	743	489
23	715	327	159	4,840	974	1,556	......	......	......	169	871	591
24	2,655	419	166	3,319	868	4,212	......	......	......	154	635	482
25	2,540	423	144	2,620	944	3,089	......	......	......	368	477	544
26	1,736	361	191	2,574	565	2,355	......	......	......	1,614	479	459
27	1,505	442	252	2,274	4,280	1,338	......	......	......	806	667	435
28	1,000	504	443	2,521	4,787	890	......	......	......	804	583	405
29	732	......	1,070	2,503	5,082	677	......	......	......	711	428	353
30	627	......	1,388	2,504	3,611	608	......	......	......	516	303	350
31	567	......	1,406	......	2,607	......	......	......	......	335	......	306

NOTE.—July 1 to October 9, 1906, repairs of dam and construction of a log way were in progress and no records of flow are available.

Monthly discharge of Sandy River near Madison.

[Drainage area, 650 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1904.					
March 23–31	5,335	890	2,682	4.12	1.38
April	11,265	1,757	4,858	7.47	8.33
May	10,325	516	3,580	5.51	6.35
June	1,064	66	355	.546	.61
July	516	66	234	.360	.42
August	1,871	135	322	.495	.57
September	1,101	42	273	.420	.47
October	4,309	224	654	1.01	1.16
November	675	224	410	.631	.70
December	440	170	299	.460	.53
1905.[a]					
January	874	224	492	.757	.87
February	645	112	313	.482	.50
March	7,908	112	1,436	2.21	2.55
April	7,026	1,046	2,558	3.94	4.40
May	2,892	477	1,336	2.06	2.37
June	3,330	224	658	1.01	1.13
July	2,653	60	292	.449	.52
August	2,078	0	224	.345	.40
September	1,601	42	350	.538	.60
October	339	37	89	.137	.16
November	388	49	215	.331	.37
December	898	165	327	.503	.58
The year	7,908	0	691	1.06	14.45

[a] After August 31, 1905, wheels were run both day and night, and values are based on both the flow over the dam and through the wheels. Gage readings and gate openings read five times daily until April 8, 1906, since when four daily readings have been made.

Monthly discharge of Sandy River near Madison—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1906.					
January	2,655	200	630	0.969	1.12
February [a]	698	208	427	.657	.68
March [a]	1,406	144	412	.634	.73
April	8,844	1,050	3,466	5.33	5.95
May [b]	5,082	565	2,456	3.78	4.36
June [b]	4,212	497	1,863	2.87	3.20
October 10-31	1,614	91	407	.626	.51
November	983	206	429	.660	.74
December	591	194	346	.532	.61

[a] During February and March, 1906, values of flow may be as much as 25 per cent too large, owing to accumulations of ice on the crest of the dam.
[b] From May 5 to July 1, 1906, 1.33 foot flashboards were used for two-thirds the length of the dam.

MESSALONSKEE STREAM AT WATERVILLE.

Messalonskee Stream enters the Kennebec from the west at Waterville. It has a total drainage area of 208 square miles, of which 30 square miles are lake surface, which renders its flow very constant and gives it considerable value for power. Of this system Messalonskee Lake is nearest to the mouth of the river. In this lower portion of the river, about 10 miles in length, there is a fall of about 210 feet, which is practically all utilized.

The United States Geological Survey maintained a gage at the dam of the Chase Manufacturing Company, in Waterville, from June 18, 1903, to January 1, 1906. A vertical staff gage is fastened to the wall of the wheel pit just above the dam. The zero of the gage corresponds to the level of the crest of the dam and is referred to a bench mark as follows: A copper bolt in a ledge on the opposite side of the river from the gage and about 20 feet from the end of the dam; elevation, 11.51 feet above the crest of the dam. The dam is a new crib without leakage and with a good crest. Generally the water is not used for power purposes at night, and the gage is read while the wheels are not running. At other times the amount of water used through the wheels is added to that which flows over the dam. Flashboards are maintained during low stages of the river.

For medium and high stages values of flow are probably not in error more than 10 to 15 per cent. For low stages they may be 25 per cent or more in error. Conditions at this station have been poor for records, owing to frequent change of gage readers and effect of pondage during low water.

Daily discharge, in second-feet, of Messalonskee Stream at Waterville.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1							183	148	119	59	60	59
2							220	112	129	59	49	59
3							205	176	119	70	59	59
4							148	212	119	61	57	59
5							159	231	89	81	66	61
6							169	205	112	54	70	33
7							169	205	138	59	73	19
8							176	183	111	51	61	51
9							127	127	111	66	66	59
10							159	212	104	36	59	59
11							142	205	104	94	66	59
12							127	194	84	94	73	145
13							169	183	89	81	59	100
14							142	194	89	70	19	51
15							142	176	111	81	41	54
16							148	112	111	75	73	51
17							243	138	111	73	59	59
18						212	231	176	99	60	59	54
19						194	159	182	84	41	59	17
20						169	194	182	48	73	59	157
21						136	194	199	112	73	66	306
22						169	194	159	212	73	61	291
23						183	293	183	220	73	59	167
24						183	314	118	19	70	59	252
25						169	194	138	26	47	59	72
26						176	169	138	41	81	59	72
27						148	159	129	66	73	59	72
28						118	176	119	94	73	73	53
29						142	176	89	73	73	54	45
30						176	209	106	59	66	76	59
31							176	124		41		112
1904.												
1				408			273	126	105	149	118	118
2				336			314	149	113	118	118	118
3				292			273	134	118	105	113	126
4				360			251	144	96	90	118	77
5				432			229	149	90	96	126	64
6				533			251	157	105	105	105	69
7				559			273	85	113	90	113	64
8				533		408	273	118	118	90	85	59
9				615		383	284	126	118	77	77	77
10				899		314	212	126	126	85	85	90
11				840		292	149	134	77	90	64	64
12				840		336	244	126	77	90	69	77
13			205	870		212	177	134	96	96	85	90
14			360	811		292	251	113	96	90	105	64
15			336	724		251	251	85	118	90	105	64
16			301	642		205	[a] 64	118	218	64	90	77
17			284	559		251	105	126	149	64	90	54
18			351	615		212	134	134	118	69	85	64
19			273	642		183	157	126	105	64	85	54
20			230	642		193	134	134	118	85	90	64
21			260	642		205	200	200	105	64	90	41
22			273			193	185	126	90	134	96	54
23			587			177	157	144	85	200	105	41
24			724			273	134	126	90	134	105	41
25			724			251	118	126	90	118	118	105
26			697			299	157	126	96	105	126	90
27			507			244	149	134	64	118	113	77
28			383			244	167	90	69	134	90	46
29			360			251	185	126	105	118	77	54
30			408			251	157	126	90	118	85	64
31			432				105	96		118		64

[a] Twelve-inch flashboards on from July 16 to December 31, 1904.

Daily discharge, in second-feet, of Messalonskee Stream at Waterville—Continued.

Day	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1905.												
1	432	395	383	697	336	212	64	90	90	......	118	......
2	408	360	360	668	314	251	......	90	90	118	149	......
3	432	251	336	587	292	273	......	118	......	......	134	......
4	434	314	336	507	336	212	......	118	118	......	149	......
5	432	360	472	533	251	193	......	118	90	......	......	......
6	383	292	457	587	314	230	......	......	90	......	......	......
7	395	292	533	533	212	177	......	118	118	......	......	......
8	642	273	507	543	230	212	......	118	64	......	......	......
9	482	301	577	577	251	177	......	90	64	118	......	......
10	432	336	587	432	301	159	......	90	......	118	......	......
11	432	348	559	472	260	111	......	90	90	149	......	......
12	408	432	615	482	336	144	......	90	90	149	......	......
13	383	360	482	457	336	144	90	......	118	118	......	......
14	408	314	507	408	360	149	77	90	118	118	......	......
15	408	336	432	383	383	111	90	90	118	......	......	......
16	383	336	383	383	383	144	......	90	90	118	......	......
17	408	360	432	408	432	177	90	90	......	149	......	......
18	422	336	383	383	408	212	90	118	90	118	......	......
19	482	432	587	422	432	177	90	118	105	149	......	......
20	472	360	587	383	533	212	105	......	64	149	......	......
21	432	336	533	432	314	193	90	90	69	118	......	......
22	432	348	482	507	273	183	90	90	90	......	......	......
23	422	360	507	408	251	177	......	90	90	134	......	......
24	434	383	472	383	212	193	118	90	......	149	......	......
25	482	336	482	360	212	177	118	90	90	134	......	......
26	472	383	995	383	251	177	90	90	118	118	......	......
27	482	360	870	395	212	[a] 64	90	......	118	149	......	......
28	482	336	753	336	432	54	118	90	105	149	......	......
29	422	......	811	336	383	54	118	90	118	......	......	......
30	434	......	753	360	251	26	......	64	118	149	......	......
31	395	......	697	......	314	......	149	90	......	149	......	......

[a] Twelve-inch flashboards on from June 27 to November 4, 1905. Figures for discharge are probably unreliable after about June 1, owing to insufficient data.

Monthly discharge of Messalonskee Stream at Waterville.

[Drainage area, 205 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1903.					
June 18–30	212	118	167	0.815	0.39
July	314	127	183	.893	1.03
August	231	89	163	.795	.92
September	220	19	100	.488	.54
October	94	36	67.1	.327	.38
November	76	19	60.4	.295	.33
December	306	17	89.2	.435	.50
1904.					
March 13–31	724	205	400	1.95	1.38
April 1–21	899	292	609	2.97	2.32
June 8–30	408	177	254	1.24	1.06
July	314	64	194	.946	1.09
August	200	85	128	.624	.72
September	218	64	105	.512	.57
October	200	64	102	.498	.57
November	126	64	97.7	.477	.53
December	126	41	71.3	.348	.40
1905.					
January	642	383	438	2.14	2.47
February	432	251	344	1.68	1.75
March	995	336	544	2.65	3.06
April	697	336	458	2.23	2.49
May	533	212	316	1.54	1.78
June	273	26	166	.810	.90

COBBOSSEECONTEE STREAM AT GARDINER.

Cobbosseecontee Stream drains a group of lakes lying from 5 to 15 miles west from Augusta. The largest of these, Cobbosseecontee Pond, has an area of 8.4 square miles, and the aggregate area of all the ponds is about 19 square miles. The Cobbosseecontee empties into the Kennebec at Gardiner, about 6 miles below Augusta, and has a total drainage area of about 240 square miles. From the ordinary surface of Lake Maranacook, one of the upper lakes, to mean tide level at the mouth of the river the fall is 206 feet. In the lower three-fourths of a mile of the river there are seven dams, affording a total fall of about 128 feet. The uppermost of these dams is controlled by the Gardiner Water Power Company, the power being used to pump the Gardiner municipal water supply directly from the river. Records of the flow at this plant have been kept since 1890.

The dam is of stone masonry, with a timber apron at the toe. The downstream face has an approximate slope of 1 horizontal to 4 vertical. The crest is horizontal and is about 6 feet wide. The upstream slope is about 1 vertical to 8 horizontal. The total length of the dam is about 100 feet, and flashboards 4.5 feet high are maintained continuously. The total head obtained is about 10 feet. The head-bay entrance is on the right bank, and from this runs a wooden penstock in which is placed a 39-inch Hercules wheel. In the head bay there is also a gatehouse with two gates which are kept partially open most of the time to regulate the proper flow down the river.

The records of flow are made up by considering (1) the flow over the dam, which is nothing except usually for a short time in the spring; (2) the flow through the sluice gates, which is regulated by means of tables drawn up for the company by Hiram F. Mills, C. E., showing the discharge through the two gates for different pond levels, the practical application of this method being to obtain a given flow at any time by setting these gates at the required gate opening, the flow through the wheel being taken into account; (3) the amount of water flowing through the 39-inch wheel, which is ascertained from this gate opening and pond level by means of a table also provided for this purpose by Mr. Mills. The water that is pumped for the Gardiner supply is neglected in computations, being but a small percentage of the flow. It is also assumed that the tail water level remains constant. The leakage by the dam was measured during 1905 and found to be 10 second-feet, and correction made accordingly. No correction for leakage has been made previous to 1905. On Sundays and legal holidays gates are closed and no water is allowed to run unless the lake is full. The flow during low-water periods of certain years before 1899 has not been previously estimated, although a record of pond level and of flow through the wheel was kept for these times. In the accompanying revised estimates the flow during these periods has been computed. Under such conditions the pond level was below the top of the sluice gates and the discharge has been based on the formula $Q=2.70\ b\ H^{\frac{3}{2}}$, b being corrected for four end contractions by subtracting 0.4 H.

It is considered that the values of flow at this point are ordinarily correct within 5 per cent. The very low water values may be in error as much as 10 per cent or more.

These records have been furnished the Survey by S. D. Warren & Co., through their engineer, A. H. Twombley, up to 1905, and since that time through Joseph A. Warren.

The Cobbosseecontee is a most remarkable example of the regularity of flow that can be obtained with proper storage.

Daily discharge, in second-feet, of Cobbosseecontee Stream at reservoir dam at Gardiner.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1890.												
1							300	290	290	290	393	300
2							300	290	290	290	379	300
3							300	0	290	290	379	300
4							0	290	290	290	379	300
5							306	290	290	0	368	300
6							326	290	290	290	357	300
7							356	290	0	290	347	0
8							374	290	290	300	347	300
9							374	290	290	300	333	300
10							340	0	290	300	333	300
11							314	290	290	300	326	300
12							306	290	290	0	300	300
13							156	290	290	300	300	300
14							300	290	0	300	300	0
15							300	290	290	300	300	300
16						340	300	290	290	300	0	300
17						356	300	0	290	300	300	300
18						356		290	290	300	379	300
19						356		290	290	0	445	300
20						340	290	290	290	300	431	300
21						326	290	290	290	300	418	0
22						0	290	290	290	300	405	300
23						300	290	290	290	300	393	300
24						300	290	34	290	337	379	300
25						306	290	290	290	337	368	0
26						314	290	290	290	337	357	290
27						314	0	290	290	345	347	290
28						306	290	290	0	345	337	0
29						0	290	290	290	349	337	290
30						300	290	290	290	379	300	290
31							290	0		393		290
1891.												
1	290	850	839	2,169	300	300	300	290	285	260	0	177
2	290	780	774	2,114	300	300	300	0	285	260	98	210
3	290	713	713	2,059	0	300	300	285	280	260	108	138
4	0	713	653	2,059	300	300	0	285	280	0	108	123
5	290	682	594	2,059	300	300	0	285	280	260	112	138
6	290	620	567	1,940	300	300	300	285	0	250	112	0
7	290	590	540	1,836	300	0	300	290	280	250	97	220
8	290		540	1,782	300	300	300	290	280	250	0	220
9	290	373	515	1,598	300	300	300	0	280	250	107	220
10	290	435	540	1,567	0	300	300	285	280	250	86	172
11	0	458	743	1,495	300	300	300	285	280	0	76	172
12	300	458	807	1,514	300	300	0	285	270	250	80	166
13	300	458	807	1,514	300	300	290	285	0	250	80	0
14	300	548	1,801	1,365	300	0	290	285	270	250	80	189
15	300	529	1,753	1,223	300	300	290	285	270	250	0	166

Daily discharge, in second-feet, of Cobbosseecontee Stream at reservoir dam at Gardiner—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1891.												
16	300	590	1,573	1,270	300	300	290	0	270	250	107	161
17	300	602	1,364	1,318	0	300	290	285	270	250	99	149
18	300	574	1,286	1,318	300	300	290	285	270	0	90	135
19	300	516	1,241	1,318	300	300	0	285	270	220	90	125
20	300	516	1,204	1,318	306	300	....	285	0	220	80	0
21	300	483	1,167	1,273	314	0	290	285	270	220	28	166
22	300	483	1,531	1,050	316	300	290	285	270	220	0	144
23	503	363	2,199	1,013	300	300	290	0	270	220	88	220
24	1,120	363	2,365	300	0	300	290	285	260	220	88	220
25	1,100	393	2,365	300	300	300	290	285	260	0	92	20
26	1,063	620	2,585	314	300	300	0	285	260	220	0	20
27	1,063	942	2,531	306	300	300	290	285	0	166	157	20
28	1,063	907	2,344	306	300	0	290	285	260	139	146	220
29	1,063	....	2,344	300	300	300	290	285	260	134	0	220
30	1,079	....	2,344	300	300	300	290	0	260	134	201	220
31	1,001	....	2,295	....	0	....	290	285	....	108	....	220
1892.												
1	220	270	280	280	0	280	280	280	280	280	280	280
2	220	270	280	280	280	280	280	280	280	0	280	280
3	0	270	280	0	280	280	0	280	280	280	280	280
4	220	280	280	280	280	280	0	280	0	280	280	0
5	250	280	280	280	280	0	280	280	280	280	280	280
6	250	280	0	294	280	280	280	280	280	280	0	280
7	250	0	280	294	280	280	280	0	280	280	280	280
8	250	280	280	294	0	280	280	280	280	280	280	280
9	250	280	280	286	280	280	280	280	280	0	280	280
10	0	280	280	0	280	280	280	280	280	280	280	280
11	250	280	280	306	280	280	0	280	0	280	280	0
12	250	280	280	294	280	0	0	280	280	280	280	280
13	250	280	0	280	280	280	0	280	280	280	0	280
14	250	0	280	280	280	280	0	0	280	280	280	280
15	270	280	280	280	0	280	0	280	280	280	280	280
16	270	280	280	280	280	280	0	280	280	0	280	280
17	0	280	280	0	280	280	0	280	280	280	280	280
18	270	280	280	280	280	0	280	280	0	280	280	0
19	270	280	280	280	280	0	280	280	280	280	280	280
20	276	280	0	280	280	280	280	280	280	280	0	280
21	276	0	280	280	280	280	280	0	280	280	280	280
22	270	280	280	280	280	280	280	280	280	280	280	280
23	270	280	280	280	280	280	280	280	280	0	280	280
24	0	280	280	0	280	280	0	280	280	280	0	280
25	270	280	280	280	280	280	280	280	0	280	280	0
26	270	280	280	280	280	0	280	280	280	280	280	280
27	270	280	0	280	280	280	280	280	280	280	0	280
28	270	0	280	280	280	280	280	0	280	280	280	280
29	270	280	280	280	280	280	280	280	280	280	280	280
30	270	....	280	280	280	280	280	280	280	0	280	280
31	0	....	280	....	280	....	0	280	....	280	....	280
1893.												
1	0	280	280	535	435	300	280	280	68	0	250	220
2	280	280	280	314	458	300	0	280	63	250	250	220
3	280	280	280	300	509	300	280	280	0	250	250	0
4	280	280	280	300	596	0	0	280	270	250	250	220
5	280	280	0	300	1,079	300	280	280	199	220	0	220
6	280	280	280	300	1,295	300	280	0	205	192	220	220
7	280	280	280	300	1,179	300	280	280	201	183	220	220
8	0	280	280	300	985	300	280	270	205	0	220	220
9	280	280	280	0	713	300	0	270	270	220	220	220
10	280	280	280	300	620	300	280	270	0	220	220	0
11	280	280	280	314	590	0	280	270	270	220	220	220
12	280	0	0	481	562	280	280	270	270	220	0	220
13	280	280	280	682	562	280	280	0	270	174	220	220
14	280	280	509	650	887	280	280	270	270	170	220	220
15	0	280	620	650	1,262	280	280	270	199	0	220	220
16	280	280	620	1,040	1,354	280	0	270	188	220	220	220
17	280	280	535	1,079	1,552	280	280	270	0	220	220	0
18	280	280	509	1,001	2,680	0	280	270	270	220	220	220
19	280	0	458	962	2,481	280	280	270	270	185	0	220
20	280	280	435	925	2,002	280	280	0	270	165	220	220

Daily discharge, in second-feet, of Cobbosseecontee Stream at reservoir dam at Gardiner—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1893.												
21	280	280	393	887	1,900	280	280	270	270	144	220	220
22	0	280	393	962	1,752	280	280	270	195	0	220	220
23	280	280	356	962	1,660	280	0	270	195	174	220	220
24	280	280	356	925	1,428	280	280	270	0	149	220	0
25	280	280	356	780	1,052	0	280	270	250	250	220	0
26	280	0	458	713	562	280	280	270	250	250	0	220
27	280	280	590	620	326	280	280	0	250	250	220	220
28	280	280	620	650	326	280	280	270	250	250	220	220
29	0	......	562	620	326	280	280	270	250	0	220	220
30	280	......	780	393	326	280	0	270	250	250	......	220
31	280	......	620	......	307	......	280	270	......	250	......	0
1894.												
1	220	220	220	0	300	925	0	280	280	270	250	250
2	220	220	220	314	300	889	280	280	0	250	250	0
3	220	220	220	314	300	674	280	280	0	250	250	250
4	220	0	0	306	280	326	0	280	280	250	0	250
5	220	220	220	306	280	326	280	0	280	250	250	250
6	220	220	220	306	0	326	280	280	280	250	250	250
7	0	220	220	306	280	326	280	280	270	0	250	250
8	220	220	220	26	280	326	0	280	270	250	250	250
9	220	220	220	326	280	326	280	280	0	250	250	0
10	220	220	220	314	280	200	280	280	270	250	250	250
11	220	0	0	314	280	326	280	280	270	250	0	250
12	220	220	276	314	280	314	280	0	270	250	250	250
13	220	220	483	314	0	300	280	280	270	250	250	250
14	0	220	483	314	280	300	280	280	270	0	250	250
15	220	220	426	0	280	280	0	280	270	250	250	250
16	220	220	426	430	280	280	280	280	0	250	250	0
17	220	220	410	430	280	0	280	280	270	250	250	250
18	220	0	405	430	280	280	280	280	270	250	0	250
19	220	220	405	314	280	280	280	0	270	250	250	250
20	220	220	630	314	0	280	280	280	270	250	250	250
21	0	220	900	314	280	280	280	280	270	0	250	250
22	220	220	887	26	280	280	0	280	270	250	250	250
23	220	220	692	326	280	280	280	280	0	250	250	0
24	220	220	306	314	280	0	280	280	270	250	250	250
25	220	0	14	314	280	280	280	280	270	250	0	0
26	220	220	314	306	326	280	280	0	270	250	250	250
27	220	220	314	300	523	280	280	280	270	250	250	250
28	0	220	314	300	499	280	280	280	270	0	250	250
29	220	......	300	0	370	280	0	280	270	250	0	250
30	220	......	300	300	523	280	280	280	0	250	250	0
31	220	......	300	......	862	......	280	280	......	250	......	250
1895.												
1	250	250	0	250	385	280	280	280	0	220	113	0
2	250	250	0	250	318	0	280	280	270	220	144	220
3	250	0	0	250	300	280	280	280	270	220	0	220
4	250	220	220	250	290	280	0	0	270	0	177	220
5	250	220	220	250	0	280	280	280	270	0	146	220
6	0	220	220	250	280	280	280	280	270	0	128	220
7	250	220	220	14	280	280	0	280	270	220	113	220
8	250	220	0	343	280	280	280	280	0	164	102	0
9	250	220	220	753	280	0	280	280	270	131	93	220
10	250	0	0	2,619	280	280	280	280	250	110	0	220
11	250	220	220	1,301	280	280	280	0	250	106	161	220
12	250	220	220	1,384	0	280	280	270	250	95	152	220
13	0	220	220	300	280	280	280	270	250	0	137	220
14	250	220	220	74	280	280	0	270	250	150	127	220
15	250	220	220	2,603	280	280	280	270	0	118	112	0
16	250	220	220	2,461	280	0	280	270	250	108	181	220
17	250	0	0	1,698	280	280	280	270	250	108	0	220
18	250	220	220	1,609	280	280	280	0	250	103	220	220
19	250	220	220	1,400	0	280	280	270	250	97	220	220
20	0	220	220	1,271	280	280	280	270	161	0	220	220
21	250	220	220	480	0	280	0	270	155	130	220	220
22	250	220	220	664	280	280	280	270	0	99	220	0
23	250	220	220	358	280	0	280	270	220	99	220	220
24	250	0	0	385	280	280	280	270	220	94	0	220
25	250	220	220	385	280	280	280	0	220	90	220	0

Daily discharge, in second-feet, of Cobbosseecontee Stream at reservoir dam at Gardiner—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1895.												
26	250	220	220	385	0	280	280	270	220	85	220	250
27	0	220	220	385	280	280	280	270	220	0	220	250
28	250	0	220	409	280	280	0	270	220	112	0	250
29	250	......	220	409	280	280	280	270	0	88	220	14
30	250	......	220	409	280	0	280	270	220	88	220	264
31	250	......	0	......	280	......	280	270	......	88	......	343
1896.												
1	0	270	0	901	300	280	280	280	250	250	0	250
2	451	0	1,959	993	300	280	280	0	250	250	220	250
3	276	270	2,698	901	0	280	280	280	250	250	220	250
4	264	270	1,959	856	300	280	0	280	250	0	220	250
5	0	......	1,637	856	300	280	0	270	250	250	220	250
6	270	270	1,219	856	300	280	280	270	0	250	220	0
7	270	270	1,219	856	280	0	280	270	250	250	220	250
8	270	270	1,226	856	280	280	280	270	250	250	0	250
9	270	0	1,368	769	280	280	280	0	250	250	220	250
10	270	270	1,368	727	0	280	280	270	250	250	220	250
11	270	270	946	727	280	280	280	270	250	0	220	250
12	0	270	1,038	727	280	280	0	270	250	250	220	250
13	270	270	1,086	727	280	280	280	270	0	250	220	0
14	270	270	1,038	812	280	0	280	270	250	220	220	250
15	270	270	901	812	280	280	280	270	270	220	0	250
16	270	0	769	901	280	280	280	0	270	220	220	250
17	270	270	727	946	0	280	280	270	270	220	220	250
18	270	270	685	1,188	280	280	260	270	250	0	250	250
19	0	270	856	1,236	280	280	0	270	250	220	250	250
20	270	270	993	1,039	280	280	280	270	0	220	250	0
21	270	270	1,581	901	280	0	280	270	250	220	250	250
22	270	270	1,429	992	280	280	280	270	250	220	0	250
23	270	0	1,275	1,039	280	280	280	0	250	220	250	250
24	270	280	1,056	901	0	280	280	270	250	220	250	250
25	270	280	728	769	280	280	280	270	250	0	250	0
26	0	280	686	644	280	280	0	270	250	220	0	250
27	270	280	812	526	280	280	280	270	0	220	250	0
28	270	280	769	300	280	0	280	270	250	220	250	250
29	270	280	727	300	280	280	280	270	250	220	0	250
30	270	......	644	300	0	280	280	0	250	220	250	250
31	270	......	727	......	0	......	280	250	......	220	......	250
1897.												
1	250	250	250	497	280	600	280	0	280	280	270	270
2	250	250	250	517	0	477	280	280	280	280	270	270
3	0	250	250	574	368	573	280	280	280	0	270	270
4	250	250	250	350	624	523	0	280	280	280	270	270
5	250	250	250	620	630	477	100	280	0	280	270	0
6	250	250	250	650	320	262	280	280	280	280	270	270
7	250	0	0	650	320	336	280	280	280	280	0	270
8	250	250	250	650	320	336	280	0	280	280	270	270
9	250	250	250	620	74	320	280	280	280	280	270	270
10	0	250	250	620	373	320	280	280	280	0	270	270
11	250	250	250	650	393	512	0	280	280	280	270	270
12	250	250	250	590	393	559	280	280	0	280	270	0
13	250	250	250	421	393	679	280	280	280	280	270	270
14	250	0	0	310	......	679	280	280	280	270	0	270
15	250	250	250	356	489	436	280	0	280	157	270	270
16	250	250	250	522	244	354	280	280	280	121	270	270
17	0	250	250	497	509	320	280	280	280	0	270	270
18	250	250	250	497	833	294	0	280	280	174	270	280
19	250	250	250	473	769	286	280	280	0	163	270	0
20	250	250	250	453	739	6	280	280	280	152	270	280
21	250	0	0	320	709	286	280	280	280	136	0	280
22	250	250	250	294	391	436	280	0	280	174	270	280
23	250	250	250	286	6	654	280	280	280	185	270	280
24	0	250	250	280	280	365	280	280	280	0	270	280
25	250	250	250	14	280	294	0	280	280	270	270	21

Daily discharge, in second-feet, of Cobbosseecontee Stream at reservoir dam at Gardiner—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
1897.												
26	250	250	250	286	280	286	280	280	0	270	270	0
27	250	250	250	280	280	0	280	280	280	270	270	280
28	250	0	0	286	320	280	280	280	280	270	0	280
29	250	......	250	286	19	280	280	0	280	270	270	280
30	250	......	250	280	914	280	280	280	280	270	270	280
31	0	......	306	......	772	......	280	280	......	0	......	280
1898.												
1	280	280	413	......	478	280	280	280	270	166	250	250
2	0	280	394	......	478	280	280	280	270	0	250	250
3	280	280	443	1,016	478	280	0	280	270	237	250	250
4	280	280	408	1,038	455	280	19	280	0	166	250	0
5	280	280	408	1,038	455	0	280	280	250	149	250	270
6	280	0	387	1,038	433	280	280	280	250	138	0	270
7	280	280	466	1,038	433	280	280	0	250	133	250	270
8	280	280	529	1,038	273	280	280	280	250	119	250	270
9	0	280	503	1,038	333	280	280	280	250	0	250	270
10	280	280	474	1,003	333	280	0	280	250	135	250	270
11	280	280	456	584	314	280	280	280	0	126	250	0
12	280	280	559	531	300	0	280	280	250	116	250	270
13	280	0	597	326	300	280	280	280	250	110	0	270
14	280	280	821	326	300	280	280	0	250	106	250	270
15	280	280	1,148	334	0	280	280	280	250	106	250	270
16	0	300	1,111	376	300	280	280	270	250	0	250	270
17	280	300	1,039	413	300	280	0	270	250	188	250	270
18	280	300	969	433	300	280	280	270	0	130	250	0
19	280	300	969	433	300	0	280	270	250	110	250	270
20	280	300	1,016	433	300	280	280	270	250	110	0	270
21	280	328	1,222	433	300	280	280	0	250	110	250	270
22	280	328	1,184	433	0	280	280	270	184	114	250	270
23	0	333	1,147	433	300	280	280	270	183	0	250	270
24	280	445	1,222	433	300	280	0	270	188	220	0	270
25	280	504	1,261	555	280	280	280	270	0	220	250	0
26	280	477	1,222	732	280	0	280	270	250	220	250	270
27	280	435	1,125	682	280	280	280	270	250	220	0	270
28	280	433	1,147	478	280	280	280	0	250	250	250	270
29	280	......	1,184	478	0	280	280	270	250	250	250	270
30	0	......	1,147	620	280	280	280	270	250	0	250	270
31	280	......	1,147	......	280	......	0	270	......	250	......	270
1899.												
1	0	270	270	300	300	280	280	280	270	0	160	160
2	270	270	270	306	300	280	0	280	270	146	180	160
3	270	270	270	306	300	280	280	280	0	136	180	0
4	270	270	270	306	300	0	19	280	270	125	170	180
5	270	0	0	359	300	280	280	280	250	110	0	180
6	270	270	270	373	300	280	280	0	250	102	180	180
7	270	270	270	395	0	280	280	280	250	83	175	170
8	0	270	270	502	300	280	280	280	250	0	170	150
9	270	270	270	842	300	280	0	280	186	110	170	135
10	270	270	270	1,198	300	280	280	280	0	99	150	0
11	270	270	270	1,262	300	0	280	280	250	110	150	120
12	270	0	0	984	300	280	280	280	250	110	0	120
13	270	270	270	772	300	280	280	0	250	110	150	120
14	270	270	270	809	0	280	280	280	168	110	150	120
15	0	270	270	809	290	280	280	280	157	0	140	120
16	270	270	270	787	290	280	0	270	146	120	130	140
17	270	270	270	947	290	280	280	270	0	105	130	0
18	270	270	270	1,243	290	0	280	270	250	94	130	140
19	270	0	0	1,387	290	280	280	270	135	101	0	135
20	270	270	270	1,427	290	280	280	0	134	96	160	135
21	270	270	270	1,403	0	280	280	270	134	87	170	135
22	0	270	270	1,331	280	280	280	270	139	0	180	135
23	270	270	270	1,145	20	280	0	270	134	64	180	135
24	270	270	270	1,130	280	280	280	270	0	65	180	0
25	270	270	270	870	280	0	280	270	220	65	180	0
26	270	0	0	669	280	280	280	270	150	65	0	150
27	270	270	270	635	280	280	280	0	135	65	170	150
28	270	270	270	470	0	280	280	270	125	74	165	140
29	0	......	280	324	280	280	280	270	105	0	150	140
30	270	......	280	0	280	280	0	270	109	160	0	140
31	270	......	280	......	280	......	280	270	......	160	......	0

Daily discharge, in second-feet, of Cobbosseecontee Stream at reservoir dam at Gardiner—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug	Sept.	Oct.	Nov.	Dec.
1900.												
1	130	220	815	776	300	300	0	260	260	230	180	220
2	130	220	1,463	495	300	300	280	260	0	220	165	0
3	130	220	2,316	417	300	0	280	260	260	190	140	220
4	125	0	2,055	656	413	300	0	260	260	175	0	220
5	125	220	1,911	977	803	280	280	0	240	175	130	220
6	125	220	1,622	907	934	280	280	260	240	150	130	220
7	0	220	1,481	1,087	831	280	280	260	240	0	130	220
8	130	220	1,295	1,379	606	280	0	260	240	160	130	220
9	110	220	1,155	1,380	456	280	280	260	0	175	200	0
10	100	220	1,155	1,342	413	0	280	260	240	180	220	220
11	90	0	1,153	1,297	348	280	280	260	240	190	0	220
12	90	220	1,116	1,297	300	280	280	0	240	220	220	240
13	90	220	1,037	1,297	0	280	280	260	235	220	220	240
14	0	2,194	999	1,297	300	280	280	260	230	0	220	230
15	100	1,573	999	1,297	300	280	0	260	230	220	220	230
16	95	1,283	999	1,213	300	280	280	260	0	220	220	0
17	90	856	1,615	1,105	300	0	280	260	250	220	220	240
18	90	562	1,611	1,072	300	280	280	260	250	220	0	240
19	90	425	1,473	1,260	300	280	280	0	250	220	220	240
20	90	294	1,518	1,380	585	280	280	260	250	220	220	240
21	0	270	1,811	1,338	704	280	280	275	245	0	220	240
22	140	270	1,662	1,260	998	280	0	275	250	220	220	240
23	160	270	1,517	1,223	1,325	280	280	275	0	220	220	0
24	200	270	1,472	1,223	1,422	0	280	275	250	220	220	240
25	200	0	1,334	1,182	1,301	280	270	275	250	220	0	0
26	200	564	1,289	869	1,016	280	260	0	250	220	220	240
27	200	662	1,206	570	456	280	260	275	250	220	220	240
28	0	776	1,206	377	357	280	260	275	245	0	220	240
29	220	....	1,105	0	300	280	0	275	230	220	220	240
30	220	....	1,015	300	300	280	260	260	0	220	220	0
31	220	....	925	....	300	....	260	260	....	200	....	240
1901.												
1	240	220	120	535	260	510	280	280	0	270	250	0
2	240	220	120	439	260	483	280	280	280	270	250	220
3	250	0	0	646	260	439	280	280	280	250	0	220
4	250	220	120	1,439	260	303	0	0	280	250	250	220
5	250	220	120	2,118	0	303	280	280	280	250	250	220
6	0	220	120	2,343	260	304	280	280	280	0	250	220
7	250	220	120	2,089	260	300	0	280	280	250	250	220
8	250	220	120	3,111	280	300	280	280	0	250	250	0
9	250	220	120	3,205	280	280	280	280	280	250	250	220
10	250	0	0	3,050	280	280	280	280	280	250	0	220
11	240	200	130	2,872	280	280	280	0	280	250	250	220
12	240	200	170	2,649	0	280	280	280	280	250	250	220
13	0	200	200	2,580	280	280	280	280	280	0	250	220
14	220	200	220	2,534	280	280	0	280	270	250	250	220
15	220	180	220	2,339	280	280	280	280	0	250	250	0
16	220	180	220	2,213	280	0	280	280	270	250	250	2,700
17	220	0	0	2,089	280	280	280	280	270	250	0	2,600
18	220	125	220	2,034	280	280	280	0	270	250	250	1,143
19	220	125	220	1,921	0	280	280	280	270	250	250	999
20	0	125	220	1,756	280	280	280	280	270	0	250	270
21	220	125	220	1,143	280	280	0	280	270	250	250	270
22	220	125	250	999	280	280	280	280	0	250	250	0
23	220	125	250	1,194	280	0	280	280	270	250	250	270
24	220	0	0	1,296	280	280	280	280	270	250	0	270
25	220	125	276	1,194	280	280	280	0	270	250	250	270
26	220	125	524	1,046	26	280	280	280	270	250	250	270
27	0	120	919	907	286	280	280	280	270	0	220	270
28	220	120	1,404	1,109	286	280	0	280	270	250	0	270
29	220	....	1,262	985	354	280	280	280	0	250	220	0
30	220	....	824	260	393	0	280	280	270	250	220	284
31	220	....	569	....	483	....	280	280	....	250	....	1,143
1902.												
1	500	463	2,400	1,803	713	0	280	280	280	280	270	270
2	348	280	2,400	1,748	713	280	280	280	280	280	0	270
3	294	280	2,222	1,593	650	280	280	0	280	280	270	270
4	280	280	1,702	1,540	566	280	20	280	280	280	270	270
5	0	280	1,583	1,390	514	280	21	280	280	0	270	270

Daily discharge, in second-feet, of Cobbosseecontee Stream at reservoir dam at Gardiner—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1902.												
6	280	280	1,370	1,071	465	280	0	280	280	280	270	270
7	280	280	1,165	848	415	280	280	280	0	280	270	0
8	280	280	1,017	280	393	0	280	280	280	280	270	270
9	280	280	878	280	373	280	280	280	280	280	0	270
10	280	280	878	354	306	280	280	0	280	280	270	250
11	280	280	1,065	705	280	280	280	280	280	280	270	250
12	0	280	1,114	819	280	280	280	280	280	0	270	250
13	280	280	1,214	927	280	280	0	280	280	280	270	250
14	280	280	1,267	900	280	280	280	280	0	280	270	0
15	280	280	1,017	705	280	0	280	280	280	280	270	250
16	280	280	746	584	280	280	280	280	280	270	0	250
17	280	280	833	531	280	280	280	0	280	270	270	250
18	280	280	1,423	465	0	280	280	280	280	270	270	250
19	0	280	1,267	438	280	280	280	280	280	0	270	250
20	280	280	1,531	438	280	280	0	280	280	270	270	250
21	280	280	1,765	415	280	280	280	280	0	270	270	0
22	280	280	1,702	369	280	0	280	280	280	270	270	250
23	1,642	280	1,583	369	280	280	280	280	280	270	0	256
24	1,446	280	1,478	345	280	280	280	0	280	270	270	276
25	1,097	280	1,370	313	0	280	280	280	280	270	270	40
26	924	280	1,267	313	280	280	280	280	280	0	270	290
27	752	280	1,165	94	280	280	0	280	280	270	270	264
28	776	280	1,017	367	280	280	280	280	0	270	270	264
29	719	....	789	367	280	0	280	280	280	270	270	256
30	479	....	1,531	350	280	280	280	280	280	270	0	250
31	479	....	1,531	....	280	....	280	0	....	270	....	250
1903.												
1	250	0	1,011	1,085	280	280	280	280	270	250	0	130
2	250	270	1,011	1,054	280	280	280	0	270	250	220	140
3	250	270	768	803	0	280	280	280	270	250	220	140
4	0	270	663	846	280	280	0	280	270	0	220	140
5	250	270	637	735	280	280	0	280	270	250	220	140
6	250	270	564	735	280	280	280	280	0	250	220	0
7	250	270	587	750	280	0	280	280	0	250	210	140
8	250	0	848	645	280	280	280	280	270	250	0	120
9	250	270	1,259	712	280	280	280	0	270	250	210	115
10	250	270	1,815	712	0	280	280	280	270	250	190	125
11	0	270	3,243	687	280	280	280	280	270	0	125	115
12	250	270	3,275	0	280	280	0	280	270	250	130	115
13	250	270	3,235	300	280	280	280	280	0	250	130	0
14	250	270	3,216	300	280	0	280	280	270	250	130	150
15	250	0	2,585	300	280	280	280	280	270	250	0	150
16	250	270	2,497	300	280	280	280	0	270	250	130	140
17	250	270	2,231	300	0	280	280	280	270	250	130	145
18	0	270	1,976	300	280	280	280	280	270	0	130	145
19	250	280	1,779	26	280	280	0	280	270	220	130	145
20	250	280	1,479	326	280	280	280	280	0	220	130	0
21	250	280	1,479	314	280	0	280	280	270	220	130	220
22	250	14	1,479	306	280	280	280	270	270	220	0	200
23	250	367	1,499	306	280	280	280	0	250	220	130	200
24	250	450	1,722	300	280	280	280	270	250	220	130	200
25	0	519	1,623	300	280	280	280	270	250	0	130	0
26	270	776	1,066	0	280	280	0	270	250	220	0	200
27	270	515	1,110	300	280	280	280	270	0	220	130	0
28	270	489	1,136	3 0	280	0	280	270	250	220	130	200
29	270	....	1,111	300	280	280	280	270	250	220	0	200
30	270	....	886	300	280	280	280	0	250	220	130	200
31	270	....	906	....	0	....	280	270	....	220	....	200
1904.												
1	200	180	160	280	2,747	280	280	265	265	265	250	220
2	200	180	160	280	2,497	280	280	265	265	0	250	220
3	0	180	160	0	1,859	280	30	265	265	265	250	220
4	200	180	200	280	725	280	29	265	0	265	250	0
5	200	180	200	280	351	0	280	265	265	265	250	320
6	200	180	0	286	283	280	280	265	265	265	0	220
7	200	0	220	306	280	280	280	0	265	265	220	220
8	200	160	250	286	393	280	280	265	265	265	220	220
9	200	160	250	320	500	280	280	265	265	0	220	220
10	0	160	280	532	956	280	0	265	265	265	220	220

Daily discharge, in second-feet, of Cobbosseecontee Stream at reservoir dam at Gardiner—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1904.												
11	200	160	290	618	1,406	280	280	265	0	250	220	0
12	180	160	280	497	2,129	0	280	265	265	250	220	220
13	180	160	186	399	1,699	280	280	265	265	250	0	200
14	180	0	280	270	1,105	280	280	0	265	250	220	180
15	180	160	280	276	362	280	280	265	265	250	220	150
16	180	160	280	276	280	280	280	265	265	0	220	130
17	0	160	280	270	537	280	0	265	265	250	220	125
18	180	130	280	270	670	280	280	265	0	250	220	0
19	180	125	280	270	699	0	280	265	265	250	220	115
20	180	125	0	250	699	280	280	265	265	250	0	115
21	180	0	280	372	699	280	265	0	265	250	220	110
22	180	120	280	462	634	280	265	265	265	250	220	110
23	180	135	280	421	489	280	265	265	265	0	220	10
24	0	150	280	250	415	280	0	265	265	250	0	10
25	180	160	337	331	300	280	265	265	0	250	220	48
26	180	160	494	331	280	0	265	265	265	250	220	48
27	180	160	649	405	280	280	265	265	265	250	0	100
28	180	0	564	565	280	280	265	0	265	250	220	100
29	180	160	529	2,652	0	280	265	265	265	250	220	100
30	180	......	329	2,747	280	280	265	265	0	200	220	100
31	0	......	280	......	280	......	......	265	......	250	......	100
1905.[a]												
1	10	160	160	565	280	285	280	260	220	10	115	180
2	115	160	150	605	280	285	10	260	220	220	115	180
3	115	160	140	453	280	285	280	260	10	220	115	10
4	115	160	140	330	280	10	145	260	220	220	115	180
5	115	30	60	340	285	285	135	260	220	220	10	180
6	115	160	130	568	285	285	260	10	220	220	180	195
7	115	160	130	882	10	280	260	260	220	220	180	195
8	10	160	125	703	285	280	260	260	220	10	180	195
9	160	160	115	530	285	280	10	260	220	220	180	195
10	160	160	120	400	285	280	260	260	10	220	180	10
11	160	160	125	290	285	10	260	260	220	220	180	195
12	160	20	35	290	285	280	260	260	220	220	10	195
13	160	160	125	290	285	280	260	10	220	220	180	195
14	160	160	115	290	10	280	260	260	220	220	180	195
15	10	160	110	290	285	280	260	260	220	10	180	195
16	160	160	105	113	285	280	10	260	220	220	180	195
17	160	160	105	290	285	280	260	260	10	220	180	10
18	160	160	100	290	285	10	260	260	220	220	180	195
19	160	25	20	290	285	280	260	260	220	220	10	195
20	160	160	160	290	285	280	260	10	220	220	180	195
21	160	160	170	290	10	280	260	260	220	220	180	195
22	10	160	200	290	285	280	260	260	220	10	180	195
23	160	160	210	10	285	280	10	260	220	220	180	195
24	160	160	210	290	285	280	260	260	10	220	180	10
25	160	160	210	290	285	10	260	260	220	210	180	25
26	160	20	10	290	285	280	260	260	220	190	10	195
27	160	160	260	290	285	280	260	10	220	170	180	195
28	160	160	260	280	10	280	260	220	220	160	180	195
29	20	......	286	280	285	280	260	220	220	10	180	195
30	160	......	484	10	10	280	10	220	220	115	10	195
31	160	......	591	......	285	......	260	220	......	115	......	10
1906.[b]												
1	195	220	260	10	795	1,100	440	735	285	280	280	275
2	195	230	260	270	722	1,080	600	780	10	280	280	10
3	195	250	260	270	724	1,020	670	380	285	280	280	275
4	195	250	10	270	724	860	660	300	285	280	10	275
5	195	250	270	270	592	650	360	10	285	280	280	275
6	195	265	265	270	294	510	300	290	285	280	280	275
7	10	265	270	270	300	630	285	290	285	10	280	275
8	195	265	270	10	592	645	10	290	285	280	280	275
9	195	265	270	270	567	620	280	285	10	280	280	10
10	195	265	270	270	545	610	275	285	290	280	280	275

[a] Leakage of dam during 1905 taken at 10 second-feet, as determined by measurements during 1905.
[b] Leakage of dam during 1906 taken at 10 second-feet as determined by measurements during 1905.

Daily discharge, in second-feet, of Cobbosseecontee Stream at reservoir dam at Gardiner—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1906.												
11	195	10	10	610	535	585	275	285	290	280	10	275
12	195	265	270	625	381	460	275	10	290	280	280	275
13	195	265	270	625	320	350	275	285	290	280	280	275
14	10	265	270	625	290	346	275	285	290	10	280	270
15	210	265	270	625	290	310	10	285	290	280	280	270
16	210	265	270	1,010	290	290	275	285	10	280	280	10
17	210	280	270	1,049	285	16	275	285	290	280	280	270
18	210	10	10	757	280	290	275	285	290	280	10	270
19	210	280	270	516	280	290	275	10	290	280	280	270
20	210	280	270	547	10	280	275	285	290	280	280	270
21	10	280	270	677	280	280	275	290	290	10	280	270
22	210	280	270	800	280	280	10	290	290	280	280	270
23	210	280	270	800	280	280	275	290	10	280	280	10
24	303	270	270	800	280	260	720	290	280	280	280	270
25	303	10	10	1,040	275	985	910	290	280	280	10	10
26	284	260	270	1,026	275	1,280	880	10	280	280	280	270
27	284	260	270	1,051	10	1,160	760	290	280	280	275	270
28	250	260	270	1,061	310	980	450	290	280	10	275	270
29	236	....	270	1,000	717	310	15	285	280	280	160	270
30	216	....	270	867	970	324	400	285	10	280	275	10
31	210	....	270	....	1,110	....	640	285	....	280	....	270

Monthly discharge of Cobbosseecontee Stream at reservoir dam at Gardiner.

[Drainage area, 240 square miles].

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1890.					
June 16-30	356	0	281	1.17	0.65
July (29 days)	374	0	281	1.17	[a] 1.35
August	290	0	244	1.02	1.18
September	290	0	261	1.09	1.22
October	393	0	283	1.18	1.36
November	445	0	345	1.44	1.61
December	300	0	250	1.04	1.20
1891.					
January	1,120	0	483	2.01	2.32
February	942	0	556	2.32	2.42
March	2,585	515	1,385	5.77	6.65
April	2,169	300	1,277	5.32	5.94
May	316	0	253	1.05	1.21
June	300	0	260	1.08	1.20
July	300	0	246	1.02	1.18
August	290	0	240	1.00	1.15
September	285	0	236	.983	1.10
October	260	0	194	.808	.93
November	201	0	80.3	.335	.37
December	220	0	147	.612	.71
The year	2,585	0	446	1.86	25.18
1892.					
January	276	0	216	.900	1.04
February	280	0	240	1.00	1.08
March	280	0	244	1.0[illegible]	1.18
April	306	0	246	1.02	1.14
May	280	0	253	1.05	1.21
June	280	0	233	.971	1.08
July	280	0	181	.754	.87
August	280	0	244	1.02	1.18
September	280	0	243	1.01	1.13
October	280	0	235	.979	1.13
November	280	0	233	.971	1.08
December	280	0	244	1.02	1.18
The year	....	....	....	.98	13.30

[a] For thirty-one days.

Monthly discharge of Cobbosseecontee Stream at reservoir dam at Gardiner—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1893.					
January	280	0	235	0.979	1.13
February	280	0	250	1.04	1.08
March	780	0	395	1.65	1.90
April	1,079	0	608	2.53	2.82
May	2,680	307	1,025	4.27	4.92
June	300	0	249	1.04	1.16
July	280	0	226	.942	1.09
August	280	0	237	.988	1.14
September	270	0	197	.821	.92
October	250	0	179	.746	.86
November	250	0	187	.779	.87
December	220	0	177	.738	.85
The year	2,680	0	330	1.38	18.74
1894.					
January	220	0	192	.800	.92
February	220	0	189	.788	.82
March	900	0	341	1.42	1.64
April	430	0	273	1.14	1.27
May	862	0	304	1.27	1.46
June	925	0	327	1.36	1.52
July	280	0	226	.942	1.09
August	280	0	244	1.02	1.18
September	280	0	217	.904	1.01
October	270	0	218	.908	1.05
November	250	0	208	.867	.97
December	250	0	202	.842	.97
The year	....	....	....	1.02	13.90
1895.					
January	250	0	218	.908	1.05
February	250	0	183	.762	.79
March	220	0	163	.679	.78
April	2,619	14	773	.322	.36
May	385	0	240	1.00	1.15
June	280	0	233	.971	1.08
July	280	0	235	.979	1.13
August	280	0	238	.992	1.14
September	270	0	200	.833	.93
October	220	0	101	.421	.49
November	220	0	144	.600	.67
December	343	0	186	.775	.90
The year	....	....	....	.77	10.47
1896.					
January	451	0	232	.967	1.11
February	280	0	235	.979	1.06
March	2,698	0	1,101	4.59	5.29
April	1,236	300	812	3.38	3.77
May	300	0	229	.954	1.10
June	280	0	243	1.01	1.13
July	280	0	235	.979	1.13
August	280	0	227	.946	1.09
September	270	0	219	.912	1.02
October	250	0	202	.842	.97
November	250	0	186	.775	.86
December	250	0	210	.875	1.01
The year	2,698	0	344	1.43	19.55
1897.					
January	250	0	210	.875	1.01
February	550	0	225	.938	.98
March	306	0	220	.917	1.06
April	650	14	438	1.82	2.03
May (30 days)	914	0	411	1.71	[a] 1.97
June	679	0	384	1.60	1.78
July	280	0	238	.992	1.14
August	280	0	235	.979	1.13
September	280	0	243	1.01	1.13
October	280	0	201	.838	.97
November	270	0	234	.975	1.09
December	280	0	231	.962	1.11
The year	914	0	272	1.15	15.40

[a] For 30 days.

Monthly discharge of Cobbosseecontee Stream at reservoir dam at Gardiner—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1898.					
January	280	0	235	0.979	1.13
February	504	0	301	1.25	1.30
March	1,261	387	843	3.51	4.05
April (28 days)	1,038	0	590	2.46	*a* 2.75
May	478	0	305	1.27	1.46
June	280	0	243	1.01	1.13
July	280	0	226	.942	1.09
August	280	0	239	.996	1.15
September	270	0	219	.913	1.02
October	250	0	200	.833	.96
November	250	0	208	.867	.97
December	270	0	233	.971	1.12
The year	....	....	....	1.33	18.13
1899.					
January	270	0	226	.942	1.09
February	270	0	231	.962	1.00
March	280	0	235	.979	1.13
April	1,427	0	776	3.23	3.60
May	300	0	245	1.02	1.18
June	280	0	243	1.01	1.13
July	280	0	226	.942	1.09
August	280	0	239	.996	1.15
September	270	0	166	.692	.77
October	160	0	86.2	.359	.41
November	180	0	131	.546	.61
December	180	0	116	.483	.56
The year	1,427	0	243	1.01	13.72
1900.					
January	220	0	119	.496	.57
February	2,194	0	453	1.89	1.97
March	2,316	815	1,365	5.69	6.56
April	1,380	0	964	4.02	4.48
May	1,422	0	544	2.27	2.62
June	300	0	245	1.02	1.14
July	280	0	222	.925	1.07
August	275	0	230	.958	1.10
September	260	0	204	.850	.95
October	230	0	180	.750	.86
November	220	0	172	.717	.80
December	240	0	187	.779	.90
The year	2,316	0	407	1.70	23.02
1901.					
January	250	0	201	.838	.97
February	220	0	149	.621	.65
March	1,404	0	299	1.25	1.44
April	3,205	260	1,736	7.23	8.07
May	483	0	254	1.06	1.22
June	510	0	275	1.15	1.28
July	280	0	235	.979	1.13
August	280	0	244	1.02	1.18
September	280	0	229	.954	1.06
October	270	0	219	.912	1.05
November	250	0	205	.854	.95
December	2,700	0	441	1.84	2.12
The year	3,205	0	374	1.56	21.12
1902.					
January	1,642	0	450	1.88	2.17
February	463	280	287	1.20	1.25
March	2,400	746	1,364	5.68	6.55
April	1,803	94	691	2.88	3.21
May	713	0	336	1.40	1.61
June	280	0	233	.971	1.08
July	280	0	227	.946	1.09
August	280	0	235	.979	1.13
September	280	0	2[illegible]3	1.01	1.13
October	280	0	239	.996	1.15
November	270	0	225	.938	1.05
December	290	0	228	.950	1.10
The year	2,400	0	396	1.65	22.52

a For 30 days.

Monthly discharge of Cobbosseecontee Stream at reservoir dam at Gardiner—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1903.					
January	270	0	222	0.925	1.07
February	776	0	286	1.19	1.24
March	3,275	564	1,571	6.55	7.55
April	1,085	0	455	1.90	2.12
May	280	0	235	.979	1.13
June	280	0	243	1.01	1.13
July	280	0	235	.979	1.13
August	270	0	232	.967	1.11
September	270	0	220	.917	1.02
October	250	0	205	.854	.98
November	220	0	126	.525	.59
December	220	0	133	.554	.64
The year	3,275	0	347	1.45	19.71
1904.					
January	200	0	157	.654	.75
February	180	0	136	.567	.61
March	649	0	278	1.16	1.34
April	2,747	0	493	2.05	2.29
May	2,747	0	778	3.24	3.74
June	280	0	243	1.01	1.13
July	280	0	223	.929	1.07
August	265	0	231	.962	1.11
September	265	0	221	.921	1.03
October	265	0	220	.917	1.06
November	250	0	188	.783	.87
December	220	0	136	.567	.65
The year	2,747	0	275	1.15	15.66
1905.					
January	160	10	127	.529	.61
February	160	20	141	.588	.61
March	591	10	166	.692	.80
April	882	10	347	1.45	1.62
May	285	10	240	1.00	1.15
June	285	10	245	1.02	1.14
July	280	10	213	.888	1.02
August	260	10	223	.929	1.07
September	220	10	192	.800	.89
October	220	10	175	.729	.84
November	180	10	143	.596	.66
December	195	10	158	.658	.76
The year	882	10	198	.823	11.18
1906.					
January	303	10	198	.825	.95
February	280	10	236	.983	1.02
March	270	10	235	.979	1.13
April	1,061	10	610	2.54	2.83
May	1,110	10	436	1.82	2.10
June	1,280	16	569	2.37	2.64
July	910	10	377	1.57	1.81
August	780	10	285	1.19	1.37
September	290	10	240	1.00	1.12
October	280	10	245	1.02	1.18
November	280	10	240	1.00	1.12
December	275	10	221	.921	1.06
The year	1,280	10	324	1.35	18.33

RELATION OF RUN-OFF TO PRECIPITATION.

KENNEBEC RIVER AT WATERVILLE.

From the table of average precipitation on the Kennebec drainage basin (p. 22), and that of mean monthly run-off (pp. 57–59), the following table has been prepared, covering the run-off and precipitation for the period 1893 to 1905, inclusive. The gage heights kept of Moosehead Lake level enable a correction to be made for the amount of water stored in the lake since May, 1895, and, as explained on page 49, the run-off at Waterville has been computed as if water had not been stored, the effect of evaporation of water while in storage, however, being neglected. The ratios of run-off to rainfall thus corrected for storage are also given in this table.

Run-off and precipitation in Kennebec River basin above Waterville, Me., 1893–1905, inclusive, by months.

[Drainage area, 4,270 square miles.]

Month.	Precipitation in inches.	Run-off in inches on drainage area.		Ratio of run-off to precipitation.	
		Observed run-off.	Estimated run-off without storage.	For observed run-off.	For estimated run-off without storage.
1893.					
January	2.1	0.46		0.22	
February	3.3	.57		.17	
March	2.6	1.13		.43	
April	2.1	3.05		1.45	
May	5.3	8.23		1.55	
June	2.2	3.99		1.81	
July	2.4	1.56		.65	
August	4.0	.61		.15	
September	3.1	.53		.17	
October	6.0	.63		.10	
November	2.4	.58		.24	
December	2.9	.43		.15	
The year	38.4	21.78		.57	
1894.					
January	2.4	.44		.18	
February	1.8	.43		.24	
March	1.6	1.08		.68	
April	1.2	3.83		3.19	
May	4.6	2.58		.56	
June	4.6	2.03		.44	
July	2.3	1.54		.67	
August	2.9	.80		.28	
September	5.0	.72		.14	
October	4.8	1.01		.21	
November	2.5	.98		.39	
December	2.3	.52		.23	
The year	36.0	15.97		.44	
1895.					
January	2.8	.55		.20	
February	.9	.44		.49	
March	1.6	.54		.34	
April	4.4	6.25		1.42	
May	2.8	2.58	3.02	.92	1.08
June	2.9	1.67	.89	.58	.31
July	3.2	.95	.68	.30	.21
August	4.3	.73	.44	.17	.10
September	1.6	.46	−.05	.29	−.03
October	1.7	.34	.47	.20	.28
November	6.1	1.46	2.05	.24	.34
December	4.7	1.62	2.23	.34	.48
The year	37.0	17.58		.47	

Run-off and precipitation in Kennebec River basin above Waterville, Me., 1893–1905, inclusive, by months—Continued.

Month.	Precipitation in inches.	Run-off in inches on drainage area.		Ratio of run-off to precipitation.	
		Observed run-off.	Estimated run-off without storage.	For observed run-off.	For estimated run-off without storage.
1896.					
January	0.7	1.16	1.42	1.66	2.03
February	3.7	.72	.57	.19	.15
March	7.0	3.54	3.73	.51	.53
April	2.0	7.16	7.80	3.58	3.90
May	2.7	4.60	4.24	1.70	1.57
June	2.5	1.44	1.00	.58	.40
July	4.4	1.44	1.01	.33	.23
August	3.6	.85	.38	.24	.11
September	4.6	.89	.81	.19	.18
October	3.5	.99	1.16	.28	.33
November	3.3	2.36	3.11	.72	.94
December	1.1	.74	.73	.67	.66
The year	39.1	25.89	25.96	.66	.66
1897.					
January	3.6	.97	.95	.27	.26
February	1.9	.90	.74	.48	.39
March	3.2	1.07	1.03	.33	.32
April	3.3	6.63	7.58	2.01	2.30
May	4.9	7.26	7.53	1.48	1.54
June	3.6	3.39	2.96	.94	.82
July	7.2	3.54	3.39	.49	.47
August	3.8	1.97	1.56	.52	.41
September	3.0	1.19	.75	.40	.25
October	1.0	.71	.65	.71	.65
November	4.4	1.48	1.64	.34	.37
December	3.2	1.44	1.87	.45	.59
The year	43.1	30.55	30.65	.71	.71
1898.					
January	4.9	.87	.85	.18	.17
February	6.8	.83	.72	.12	.11
March	1.0	3.04	2.71	3.04	2.71
April	2.2	7.79	8.95	3.54	4.07
May	1.6	6.78	6.82	4.24	4.26
June	3.3	2.61	2.04	.79	.62
July	1.5	1.06	.42	.71	.28
August	3.7	.84	.42	.23	.11
September	3.3	.68	.60	.21	.18
October	4.4	1.09	1.28	.25	.29
November	4.3	1.35	1.72	.31	.40
December	1.3	.71	.86	.54	.66
The year	38.3	27.65	27.39	.72	.72
1899.					
January	2.4	.64	.55	.27	.23
February	3.3	.58	.39	.17	.12
March	4.6	.87	.82	.19	.18
April	.9	6.27	7.15	6.96	7.95
May	2.2	5.74	6 02	2.61	2.74
June	1.8	2.30	1.72	1.28	.96
July	5.4	1.37	1.25	.25	.23
August	.9	.89	54	.99	.60
September	3.0	.48	.07	.16	.02
October	1.5	.34	.17	.23	.11
November	2.4	.59	.60	.24	.25
December	2.5	.74	.85	.30	.34
The year	30.9	20.81	20.13	.67	.65

Run-off and precipitation in Kennebec River basin above Waterville, Me., 1893–1905, inclusive, by months—Continued.

Month.	Precipitation in inches.	Run-off in inches on drainage area.		Ratio of run-off to precipitation.	
		Observed run-off.	Estimated run-off without storage.	For observed run-off.	For estimated run-off without storage.
1900.					
January	5.6	0.64	0.66	0.11	0.12
February	6.8	2.21	2.60	.33	.38
March	5.0	2.47	2.63	.49	.53
April	1.3	7.43	8.37	5.72	6.44
May	4.6	7.63	7.92	1.66	1.72
June	3.9	2.64	2.19	.68	.56
July	4.6	1.55	1 38	.34	.30
August	1.8	1.13	61	.63	.34
September	3.1	.74	.29	.24	.09
October	3.4	.83	.75	.24	.22
November	6.5	1.66	2.09	.26	.32
December	1.9	1.11	1.11	.58	.59
The year	48.5	30.04	30.60	.62	.63
1901.					
January	2.7	.86	.71	.32	.26
February	1.5	.61	.44	.40	.29
March	3.9	1.30	1.04	.33	.27
April	6.0	10.7	12.55	1.79	2.09
May	2.3	4.09	3.94	1.78	1.71
June	3.8	2.15	1.70	.57	.45
July	3.9	1.38	.86	.35	.22
August	3.9	1.13	1.17	.29	.30
September	2.2	.74	.38	.33	17
October	2.8	.79	.46	.28	.16
November	2.3	.63	.46	.27	.20
December	7.6	3.21	2.71	.27	.36
The year	42.9	27.59	26.42	.64	.62
1902.					
January	2.9	1.04	1.23	.36	42
February	3.0	.92	.77	.31	.26
March	8.3	7.76	8 08	.94	.97
April	3.3	5.79	6.79	1.75	2.06
May	4.3	4.55	4.59	1.06	1.07
June	6.1	3.98	3.87	.65	.64
July	2.7	2.11	1 54	.78	.57
August	4.5	1.36	1.07	.30	.24
September	3.8	1.10	1.07	.29	.28
October	4.9	1.42	1.42	.29	.29
November	1.2	1.18	1.46	.98	1.22
December	4.0	1.18	.76	.30	.19
The year	49.0	32.40	32.65	.66	.67
1903.					
January	3.9	1.08	1.08	.28	28
February	3.4	.97	.70	.29	.20
March	5.6	5.23	6 05	.93	1.08
April	1.9	4.30	4.33	2.26	2.28
May	.5	1.96	1.91	3.92	3.83
June	4.8	1.75	1.41	.36	.29
July	4.8	1.40	.99	.29	.21
August	2.9	1.04	.80	.36	.28
September	.9	.65	.21	.73	.23
October	2.7	.52	.21	.19	.08
November	1.4	.38	.22	.27	.16
December	2.9	.37	[a] .37	.13	.13
The year	35.7	19.66	[a] 18.28	.55	.51

[a] From December, 1903, to April, 1904, inclusive, no correction made for storage.

Run-off and precipitation in Kennebec River basin above Waterville, Me., 1893–1905, inclusive, by months—Continued.

Month.	Precipitation in inches.	Run-off in inches on drainage area.		Ratio of run-off to precipitation.	
		Observed run-off.	Estimated run-off without storage.	For observed run-off.	For estimated run-off without storage.
1904.					
January	3.0	0.26	[a] 0.26	0.09	0.09
February	1.5	.23	[a] .23	.16	.16
March	2.9	1.02	[a] 1.02	.35	.35
April	5.4	3.90	[a] 3.90	.72	.72
May	5.8	5.59	7.24	.97	1.25
June	2.9	2.16	1.81	.74	.62
July	5.1	1.44	1.15	.28	.23
August	4.9	1.27	.82	.26	.17
September	5.8	1.12	1.18	.19	.20
October	2.4	1.27	1.63	.53	.68
November	1.5	.88	.84	.59	.56
December	1.6	.74	.48	.46	.30
The year	42.8	19.89	[a] 20.56	.46	.48
1905.					
January	3.9	.83	.16	.21	.04
February	1.1	.64	.35	.58	.31
March	1.3	1.42	1.58	1.09	1.22
April	2.1	3.52	4.45	1.68	2.12
May	3.1	2.83	3.53	.91	1.14
June	3.9	1.75	1.50	.45	.39
July	4.2	1.26	.82	.30	.20
August	2.1	.86	.37	.41	.18
September	4.2	.78	.52	.18	.12
October	1.0	.48	.21	.48	.21
November	3.4	.60	.48	.48	.14
December	2.9	.56	.40	.19	.14
The year	33.2	15.52	14.37	.47	.43

[a] From December, 1903, to April, 1904, inclusive, no correction made for storage.

The subjoined table shows the observed average monthly discharge at Waterville from 1893 to 1905 and from 1896 to 1905; the estimated average monthly discharge at Waterville from 1896 to 1905 if no water had been stored; the average monthly precipitation from 1893 to 1905 and from 1896 to 1905; and the ratio of the run-off to precipitation.

The effect of storage on the distribution of seasonal run-off is clearly shown by a comparison of the last two columns in the table. During April and May water is being stored; from June to September inclusive this stored water is being let out; and during the remainder of the year there is little effect from storage.

Summary of run-off and precipitation in Kennebec River basin above Waterville, Me., 1893–1905, inclusive.

[Drainage area, 4,270 square miles.]

Month.	Run-off in second-feet per square mile.			Run-off in inches on drainage area.			Precipitation in inches.		Ratio of run-off to precipitation.		
	Observed run-off.		Estimated run-off without storage.	Observed run-off.		Estimated run-off without storage.			For observed run-off.		For estimated run-off without storage.
	1893–1905.	1896–1905.	1896–1905.	1893–1905.	1896–1905.	1896–1905.	1893–1905.	1896–1905.	1893–1905.	1896–1905.	1896–1905.
January	0.67	0.72	0.68	0.77	0.83	0.78	3.15	3.36	0.24	0.25	0.23
February	.74	.82	.72	.77	.85	.75	3.00	3.30	.26	.26	.23
March	2.03	2.40	2.49	2.34	2.77	2.87	3.74	4.28	.63	.65	.67
April	5.29	5.70	6.44	5.90	6.36	7.18	2.78	2.84	2.12	2.24	2.53
May	4.30	4.43	4.67	4.96	5.11	5.38	3.44	3.20	1.44	1.60	1.68
June	2.19	2.17	1.82	2.44	2.42	2.03	3.56	3.66	.69	.66	.55
July	1.63	1.44	1.11	1.88	1.66	1.28	3.98	4.38	.47	.38	.29
August	.90	.98	.67	1.04	1.13	.77	3.33	3.21	.31	.35	.24
September	.70	.75	.53	.78	.84	.59	3.35	3.39	.23	.25	.17
October	.69	.73	.69	.80	.84	.80	3.09	2.76	.26	.30	.29
November	.98	1.00	1.13	1.09	1.12	1.26	3.21	3.07	.34	.36	.41
December	.81	.93	1.01	.93	1.07	1.16	3.00	2.90	.31	.37	.40
Total				23.70	25.00	24.85	39.63	40.35			
Monthly average	1.74	1.84	1.83	1.98	2.08	2.07	3.30	3.36	.60	.62	.62

RUN-OFF AND PRECIPITATION ON COBBOSSEECONTEE STREAM AT GARDINER.

The following table has been prepared for precipitation and run-off on Cobbosseecontee Stream at Gardiner, covering the period 1891 to 1905, inclusive, precipitation being taken from the records at Gardiner, except for a few Lewiston records during 1891–92. It must be kept in mind that the run-off from this drainage basin is controlled to a very large extent by lake storage, and for that reason the monthly ratios are not in general the actual run-off ratios. The mean results for the year are, however, probably not greatly affected in this way, although the general effect of storage is to reduce the amount of these ratios.

Run-off and precipitation in basin of Cobbosseecontee Stream above Gardiner, Me., 1891–1905, inclusive.

[Drainage area, 240 square miles.]

Month.	Precipitation in inches.	Run-off in inches on drainage area.	Ratio of run-off to precipitation.	Month.	Precipitation in inches.	Run-off in inches on drainage area.	Ratio of run-off to precipitation.
1891.				1895.			
January	8.10	2.32	0.29	January	2.50	1.05	0.42
February	3.89	2.42	.62	February	1.64	.794	.48
March	7.03	6.65	.95	March	2.48	.783	.32
April	2.89	5.94	2.06	April	4.83	.359	.74
May	2.60	1.21	.47	May	1.50	1.15	.79
June	3.64	1.20	.33	June	2.01	1.08	.54
July	5.27	1.18	.22	July	4.55	1.13	.25
August	2.97	1.15	.39	August	3.28	1.14	.35
September	1.00	1.10	1.10	September	1.21	.929	77
October	2.40	.932	.39	October	1.82	.485	.27
November	2.66	.374	.14	November	6.85	.669	.10
December	5.27	.706	.13	December	4.40	.898	.20
The year	47.72	25.18	.53	The year	37.07	10.47	.28
1892.				1896.			
January	5.52	1.04	.19	January	.87	1.11	1.28
February	2.21	1.08	.49	February	5.25	1.06	.20
March	2.43	1.18	.49	March	7.19	5.29	.74
April	1.05	1.14	1.09	April	2.02	3.77	1.87
May	4.62	1.21	.26	May	2.80	1.10	.39
June	7.22	1.08	.15	June	1.94	1.13	.58
July	3.18	.869	.27	July	3.18	1.13	.35
August	8.11	1.18	.15	August	2.88	1.09	.38
September	4.48	1.13	.25	September	7.60	1.02	.13
October	1.81	1.13	.63	October	2.64	.971	.37
November	4.54	1.08	.24	November	4.12	.865	.21
December	1.49	1.18	.79	December	1.52	1.01	.67
The year	46.66	13.30	.28	The year	42.01	19.55	.46
1893.				1897.			
January	2.70	1.13	.42	January	4.51	1.01	.22
February	4.79	1.08	.23	February	2.13	.977	.46
March	3.18	1.90	.60	March	4.30	1.06	.25
April	2.52	2.82	1.12	April	2.03	2.03	.71
May	4.66	4.92	1.05	May	5.94	1.97	.33
June	2.56	1.16	.45	June	4.32	1.78	.41
July	1.12	1.09	.98	July	3.15	1.14	.36
August	3.27	1.14	.35	August	2.66	1.13	.43
September	3.23	.916	.28	September	3.11	1.13	.36
October	5.90	.860	.15	October	.92	.966	1.05
November	1.83	.869	.47	November	5.99	1.09	.18
December	5.13	.851	.17	December	3.83	1.11	.29
The year	40.89	18.74	.46	The year	43.72	15.39	.35
1894.				1898.			
January	3.30	.922	.28	January	5.54	1.13	.20
February	1.99	.821	.41	February	5.45	1.30	.24
March	1.44	1.64	1.14	March	1.76	4.05	2.30
April	1.86	1.27	.68	April	3.44	2.75	.80
May	5.84	1.46	.25	May	1.60	1.46	.91
June	1.18	1.52	1.29	June	3.56	1.13	.32
July	2.30	1.09	.47	July	.98	1.09	1.10
August	3.08	1.18	.38	August	3.73	1.15	.31
September	3.81	1.01	.27	September	2.90	1.02	.34
October	4.25	1.05	.25	October	6.23	.960	.10
November	2.21	.967	.44	November	4.57	.697	.21
December	2.80	.971	.35	December	2.74	1.12	.41
The year	34.06	13.90	.41	The year	42.50	18.13	.43

Run-off and precipitation in basin of Cobbosseecontee Stream above Gardiner, Me., 1891–1905, inclusive—Continued.

Month.	Precipitation in inches.	Run-off in inches on drainage area.	Ratio of run-off to precipitation.	Month.	Precipitation in inches.	Run-off in inches on drainage area.	Ratio of run-off to precipitation.
1899.				1903.			
January	3.41	1.09	0.32	January	4.54	1.07	0.24
February	3.10	1.00	.32	February	3.63	1.24	.34
March	5.56	1.13	.20	March	6.65	7.55	1.13
April	1.19	3.60	3.02	April	1.42	2.12	1.49
May	1.87	1.18	.63	May	.45	1.13	2.51
June	2.43	1.13	.47	June	5.12	1.13	.22
July	5.48	1.09	.20	July	4.77	1.13	.24
August	1.08	1.15	1.06	August	2.90	1.11	.38
September	3.90	.772	.20	September	1.34	1.02	.76
October	1.85	.414	.22	October	3.82	.985	.26
November	2.42	.609	.25	November	1.63	.586	.36
December	2.61	.557	.21	December	3.56	.639	.18
The year	34.90	13.72	.39	The year	39.83	19.71	.50
1900.				1904.			
January	7.19	.572	.08	January	4.12	.754	.18
February	8.96	1.97	.21	February	2.24	.612	.27
March	7.23	6.56	.91	March	3.71	1.34	.36
April	2.50	4.48	1.79	April	7.10	2.29	.32
May	5.42	2.62	.48	May	3.95	3.74	.95
June	1.34	1.14	.85	June	1.29	1.13	.88
July	1.87	1.07	.57	July	1.25	1.07	.86
August	2.77	1.10	.40	August	4.53	1.11	.25
September	2.45	.948	.39	September	5.09	1.03	.20
October	4.47	.865	.19	October	2.02	1.06	.53
November	5.28	.800	.15	November	2.39	.874	.37
December	1.64	.898	.55	December	2.28	.654	.29
The year	51.12	23.02	.45	The year	39.97	15.66	.39
1901.				1905.			
January	3.78	.966	.26	January	4.85	.61	.13
February	1.76	.647	.37	February	1.32	.612	.46
March	6.25	1.44	.23	March	.94	.798	.85
April	6.43	8.07	1.25	April	2.10	1.62	.77
May	3.97	1.22	.31	May	2.17	1.15	.53
June	1.36	1.28	.94	June	4.83	1.14	.24
July	4.26	1.13	.27	July	4.52	1.02	.23
August	5.54	1.18	.21	August	2.03	1.07	.53
September	2.08	1.06	.51	September	4.09	.893	.22
October	4.18	1.05	.25	October	.78	.84	1.08
November	2.41	.953	.39	November	3.95	.665	.17
December	9.43	2.12	.22	December	3.12	.759	.24
The year	51.45	21.12	.41	The year	34.70	11.18	.32
1902.							
January	2.67	2.17	.81				
February	1.70	1.25	.74				
March	10.33	6.55	.63				
April	3.71	3.21	.87				
May	2.01	1.61	.80				
June	4.52	1.08	.24				
July	2.07	1.09	.53				
August	4.46	1.13	.25				
September	3.22	1.13	.35				
October	4.90	1.15	.23				
November	1.21	1.05	.87				
December	5.35	1.10	.21				
The year	46.15	22.52	.49				

The following table shows for the whole period the run-off and precipitation, and the ratio of these two factors, by calendar months, just as was done for Waterville. It will be noted that the mean yearly ratio of run-off to precipitation at Gardiner is 0.41, whereas at Waterville for the period 1896 to 1905 it is 0.62, both for observed run-off and for that corrected for storage. The average yearly discharge at Gardiner is 1.28 second-feet per square mile of drainage area; at Waterville (1896–1905) it is 1.84 second-feet. For the longer period, 1893 to 1905, at Waterville the ratio of run-off to precipitation and the average yearly discharge are slightly less, being respectively 0.60 and 1.74 second-feet.

Summary of run-off and precipitation in basin of Cobbosseecontee Stream above Gardiner, Me., 1891–1905, inclusive.

[Drainage area, 240 square miles.]

Month.	Average run-off in second-feet per square mile of drainage area.	Run-off in inches on drainage area.	Precipitation in inches.	Ratio of run-off to precipitation.
January	0.98	1.13	4.24	0.27
February	1.07	1.11	3.34	.33
March	2.77	3.19	4.70	.68
April	2.72	3.03	3.06	.99
May	1.57	1.81	3.29	.55
June	1.08	1.20	3.15	.38
July	.94	1.08	3.20	.34
August	.98	1.13	3.55	.32
September	.90	1.00	3.30	.30
October	.79	.91	3.20	.28
November	.74	.83	3.47	.24
December	.84	.97	3.68	.26
Total		17.39	42.18	
Monthly average	1.28	1.45	3.52	.41

EVAPORATION.

No measurements of evaporation from the water surface have been made in the Kennebec drainage basin, but from data obtained by the United States Geological Survey at several points in Maine during the past year, an approximate idea may be obtained as to its amount.

Stations for the measurement of evaporation from the water surface are in operation as follows:

Evaporation stations in Maine.

Station.	Location.	Date established.
Soldier Pond	Soldier Pond	July 1, 1905.
Millinocket	Ferguson Pond	Do.
Lewiston	Androscoggin River	Do.
Upper Dam	Mooselookmaguntic Lake	August 19, 1905.

The method used for the measurement of evaporation has been that of the floating raft and dish, commonly used for this purpose. Pl. II, *B* (p. 26), shows the evaporation raft, etc., on Androscoggin River at Lewiston, Me., in the mill pond of the Union Water Power Company. A skeleton log raft about 15 feet square is arranged to float with its surface just out of the water. A clear opening 6 feet square is left in the center and in this opening the evaporation pan floats, its top being kept perhaps 2 or 3 inches above the water surface by means of galvanized-iron pontoons, which are cylindrical in shape and air-tight. The evaporation pan is 3 feet square and 18 inches deep, and is constructed of galvanized iron, properly braced with iron straps. A spindle with sharp point is fixed vertically in the middle of the pan, with its point 1 or 2 inches below the top.

In measuring the amount of evaporation the water surface is made of exactly the same height as the point of the spindle, and then at the next time of observation the process is repeated, the amount of water required to restore the water surface to the level of the spindle point being noted. The spindle is surrounded by a thin iron cylinder about 3 inches in diameter, with its axis parallel to the spindle and closed with the exception of some small holes near the bottom. This prevents rapid movement of the water surface and enables very close determinations to be made of its height. A small cup of such capacity that it represents 0.01 inch depth of water in the pan is used for pouring in the water (or dipping it out in case it has rained and the rainfall has exceeded the evaporation), so that the number of cupfuls represents the change in depth in hundredths of inches—the evaporation if there has been no rainfall. A rain gage is maintained on the raft so that correction can be made for any rainfall.

The temperature of the air and of the water in the pan and outside of the pan are noted, and at the Millinocket and Lewiston stations relative humidity and velocity of wind are also observed.

The results obtained have been in general very satisfactory, and it has been found that with the spindle point surrounded by a cylinder, as just described, the water surface moves but little, even when the pan is being considerably shaken about by wave motion. A difference of half a cupful (0.005 inch) can readily be detected.

The figures given in the subjoined table for evaporation during the frozen season are from the Lewiston station. They were obtained by filling an iron dish, allowing it to freeze solidly, and then exposing it. The weight was observed from time to time and the loss by evaporation thus determined. Continuous observations could not be made owing to interruptions by rain and sleet. In all probability the amounts observed in this way are considerably larger than the actual amount of evaporation on lakes and reservoirs, as usually some snow is on hand to protect the lake ice cover.

About one year's records of evaporation are now available, and the monthly amounts as observed are given below. For the purpose of comparison the evaporation from the water surface in the vicinity of Boston, as determined by FitzGerald,[a] are also given.

Evaporation from water surface, in inches, in Maine and Massachusetts.

Period.	Soldier Pond, Me.	Millinocket, Me.	Lewiston, Me.	Average evaporation at three stations in Maine for full months.	Average evaporation near Boston, Mass.
1905.					
July	4.30	5.56	5.99	5.28	6.21
August	5.25	5.80	4.32	5.12	5.97
September	2.65	3.32	3.02	3.00	4.80
October	1.51	2.94	2.54	2.33	3.47
November 1-15	.16	.48	.38	.68	2.24
December (24 days)			.60	.77	1.38
1906.					
January (22 days)			.90	1.27	.98
February (24 days)			.71	.83	1.01
March (26 days)			1.87	2.23	1.45
April (25 days)			2.90	3.48	2.39
May	1.67		2.14	1.90	3.82
June	2.88		2.86	2.87	5.34
The period				29.76	39.12

It is evident from the foregoing table that evaporation from the water surface is, as would be expected, considerably less in Maine than near Boston. Of course but one year's records are at hand for Maine, and more data may show a considerable change from the present results, but as evaporation is a factor which does not vary greatly for a given month from year to year it is believed that these figures—especially those for the summer months—afford a fair idea of what may be expected. Probably the average annual evaporation from the water surface in Maine is about 30 inches, as compared with 39.12 inches at Boston. For the period from May to September, inclusive, evaporation in Maine is 18.17 inches, as compared with 26.14 inches near Boston.

FLOODS ON KENNEBEC RIVER.

Valuable records regarding floods on Kennebec River during the past century have been gathered by the Hollingsworth & Whitney Company, and through its courtesy have been furnished for use in the preparation of this report.

FLOOD OF 1832.

The greatest freshet of early times, and the one with which all later ones have been compared, was that of May 22, 1832. At that time there was probably no dam at Moosehead Lake outlet, and the freshet

[a] FitzGerald, Desmond. Evaporation: Trans. Am. Soc. Civil Eng., vol. 15, 1886, p. 581.

is said to have resulted from a northeasterly storm of about two weeks' duration, with a strong wind, which probably tended to increase the discharge from the lake.

FLOOD OF DECEMBER, 1901.

In December, 1901, occurred a freshet which was of probably greater magnitude than that of 1832 and regarding which fairly complete data are at hand.

WEATHER CONDITIONS.

During November, 1901, the precipitation in the Kennebec basin was considerably below the average, the deficiency for the month being nearly 0.9 inch. (See table, p. 22.) December was, however, remarkable in the amount of precipitation, the excess above the normal for the month being about 4.5 inches, and a little over half of this occurring before December 16. Probably most of the precipitation during November remained as snow storage at the end of the month. Good-sized storms occurred about December 3 and 10, the precipitation from which was practically all held as snow storage. During December 13 to 15 there was a warm rain, which melted the greater part of the snow on the ground and caused the flood conditions. The following tables give the precipitation and temperature in the Kennebec basin during the period mentioned:

Precipitation, in inches, in Kennebec basin, November and December, 1901.

	Fairfield.	Mayfield.	The Forks.	Kineo.
Water equivalent of snow on ground December 1	2.19	2.20	2.60	2.70
December 1–13, inclusive	2.99	2.15	3.20	2.90
December 14–15 (storm)	2.63	3.00	3.50	1.70
	7.81	7.35	8.30	7.30

Maximum and minimum daily temperatures in Kennebec basin, December 1–20, 1901.

Day.	Fairfield.		Kineo.		Day.	Fairfield.		Kineo.	
	Maximum.	Minimum.	Maximum.	Minimum.		Maximum.	Minimum.	Maximum.	Minimum.
	°F.	°F.	°F.	°F.		°F.	°F.	°F.	°F.
1	30	7	39	26	11	40	26	33	20
2	43	14	41	10	12	35	9	28	15
3	42	20	20	15	13	34	16	34	17
4	24	15	18	12	14	53	33	43	33
5	26	−7	15	9	15	54	44	43	33
6	24	−15	15	0	16	51	6	33	−3
7	22	−13	14	−3	17	23	6	5	−5
8	28	4	12	10	18	23	7	9	2
9	38	25	31	15	19	19	5	10	5
10	46	26	35	28	20	21	8	15	8

The rain of December 13 began in the evening, but most of the rainfall occurred during the day of December 15 (Sunday), the weather clearing on the evening of that day. During most of these three days, and extending to the evening of the 16th, the temperature was abnormally high (see table, p. 116), so that the combined effect of rain and high temperature was sufficient to release the greater part of the precipitation that had been stored on the ground since about November 1. It is probably safe to assume that an average of 6 inches depth of water on the entire Kennebec drainage basin was released at this time.

RUN-OFF DURING FLOOD OF DECEMBER, 1901.

The following table gives the conditions of gage height and run-off at Waterville during December 15–23:

Discharge of Kennebec River at Waterville, Me., during flood of December, 1901.

Date.	Hour.	Gage height. (Referred to Hollingsworth & Whitney datum.)	Depth of flow over dam.	Discharge.
		Feet.	*Feet.*	*Sec.-feet.*
December 15	7 a. m.	125.00	1.30	3,540
Do	12 m.	126.10	2.40	8,910
Do	6 p. m.	129.10	5.40	30,500
December 16	12 a. m.	132.80	13.30	121,300
Do	1 a. m.	133.64	14.14	133,500
Do	2 a. m.	133.94	14.44	138,100
Do	3 a. m.	134.33	14.83	144,100
Do	4 a. m.	134.45	14.95	145,900
Do	5 a. m.	134.70	15.20	149,800
Do	6 a. m.	135.05	15.55	155,200
Do	7 a. m.	135.15	15.65	156,800
Do	8 a. m.	135.15	15.65	156,800
Do	9 a. m.	135.15	15.65	156,800
Do	10 a. m.	135.05	15.55	155,200
Do	11 a. m.	135.00	15.50	154,500
Do	12 m.	134.80	15.30	151,300
Do	1 p. m.	134.00	14.50	139,000
Do	2 p. m.	133.50	14.00	131,600
Do	3 p. m.	133.30	13.80	128,600
Do	4 p. m.	132.60	13.10	118,400
Do	5 p. m.	132.20	12.70	112,700
Do	6 p. m.	131.80	12.30	107,200
December 17	12 a. m.	129.10	9.60	72,400
Do	7 a. m.	127.40	7.90	53,400
Do	12 m.	126.70	7.20	46,200
Do	5 p. m.	126.10	6.60	40,400
December 18	12 m.	124.40	4.90	25,600
December 19	12 m.			19,900
December 20	12 m.			11,800
December 21	12 m.			6,380
December 22	12 m.			5,230
December 23	12 m.			3,980

It is assumed in the above table that the flashboards were off entirely between 6 p. m. and midnight of December 15. Up to this latter time the depth of flow on the dam is obtained by subtracting 124.7 feet (elevation of top of flashboards) from the gage height. After and including midnight of December 15 the elevation of the crest of the dam (119.5 feet) is used.

The mean daily flow, December 15–18, was as follows (that for December 16 is based on hourly observations):

Mean flow of Kennebec River at Waterville, Me., December 15–18, 1901.[a]

	Second-feet.
December 15	27,300
December 16	127,000
December 17	46,600
December 18	29,300

The maximum discharge at Madison was computed by H. S. Ferguson and found to be 105,000 second-feet. The length of the dam is 550 feet. At 8 a. m. December 15 the water was just flowing over the crest; at midnight that day it reached the maximum height of 14.5 feet, and by 10 a. m. December 16 it had dropped to about 9 feet on the crest.

At The Forks the maximum gage height reached was 9.0 feet December 15, corresponding to a discharge of about 22,400 second-feet.

MAXIMUM DISCHARGE DURING FLOOD OF DECEMBER, 1901.

Only a few gates were open at the Moosehead Lake outlet during this flood, and practically all of the excess inflow was held in the lake, so that about 1,240 square miles of drainage area should be disregarded, in part, at least, in computing the probable yield per square mile below Moosehead. The rise in the level of the lake occasioned by this freshet (see table, p. 72) was from gage height 1.25 feet December 13 to the maximum of 4.5 feet February 3, 1902, a total amount of 3.25 feet.

The following table gives the maximum flow at several points and the corresponding unit flow per square mile, with and without the drainage area above the Moosehead Lake outlet:

Maximum discharge of Kennebec River during the freshet of December, 1901.

	Waterville.	Madison.	The Forks.
Maximum discharge, in second-feet	156,800	105,000	22,400
Maximum run-off, in second-feet per square mile:			
Including drainage area above Moosehead outlet	36.7	32.8	14.3
Not including drainage area above Moosehead outlet	51.6	53.6	68.0

A portion at least of the drainage area at the Moosehead outlet should be considered in the foregoing computations, so that the probable maximum yield at Waterville and Madison was perhaps 45 second-feet per square mile of drainage area tributary during the flood.

[a] These figures vary slightly from those given on p. 54, which are based on a single reading of the gage.

COMPARATIVE HEIGHTS OF FLOODS.

Several landmarks along Kennebec River in the vicinity of Waterville and Winslow have existed for such a length of time as to furnish data on comparative heights of water in freshets since and including that of 1832. Perhaps the most interesting and valuable of these is the "freshet oak," as it is called, situated in Winslow, on the east side of Ticonic Bay, about 1,000 feet below the highway bridge, near the Lockwood Company's dam. Pl. III, *B*, shows the "freshet oak" at about the time of highest water, December 16, and Pl. III, *A* (looking in the opposite direction), shows it a few days later, when the river was at about normal height. Marks made by logs at various times of high water for many years are plainly discernible in the second view, also the height reached in this December flood, as shown by ice adhering to the tree. These photographs were taken by James L. Dean, engineer of the Hollingsworth & Whitney Company, and furnished through his courtesy.

Dates of important freshets on Kennebec River and heights on the "freshet oak" are given in the following table:

Approximate height of water at "freshet oak" during floods.

	Feet.[a]
May 22, 1832	104.8
October, 1854	102.8
October, 1869	102.7
April 30, 1887	102.2
December 16, 1901	105.14

As the flow of Kennebec River in the vicinity of the "freshet oak" is comparatively free, the nearest dam downstream, that at Augusta, being about 17 miles distant, these gage heights probably give a very good index of the relative magnitude of these freshets.

The flood of December, 1901, is, so far as known, by far the greatest flood of the past century. As it came at a time of the year when the ice was not very thick and when few logs were in the river, there was little obstruction to flow. The height of water in the 1832 freshet, and, in fact, that in many other periods of abnormally high water since, was due to log jams and collected débris holding back the water, probably at Fairfield, until the whole mass gave way, producing the flood wave.

The water held back at Moosehead Lake in December, 1901, would have probably increased the maximum flow at Waterville by one-sixth, and unquestionably a large amount of additional damage would have resulted to property along the river if the discharge from this portion of the drainage basin had not been mostly shut off.

[a] Hollingsworth & Whitney datum.

LOW-WATER CONDITIONS.

KENNEBEC RIVER.

The most severe and long-continued drought in the period covered by this report, viz, from 1895 to 1906, occurred during the last part of 1903 and the early part of 1904. During this time the Moosehead Lake level was below the bottom or zero of the gage at the outlet, and no data on change in lake level between December, 1903, and April, 1904, are at hand. It is probable, however, that the flow during most of this time was little affected by lake storage, so that the run-off was approximately normal. The following table gives the run-off during this low-water period at Waterville, North Anson, and The Forks for various lengths of time:

Run-off of Kennebec River during low-water conditions of 1903–4.

Lowest or lowest successive—	Waterville (drainage area, 4,270 square miles).			North Anson (drainage area, 2,790 square miles).			The Forks (drainage area, 1,570 square miles).	
	Period.	Mean discharge in second-feet.	Run-off in second-feet per square mile.	Period.	Mean discharge in second-feet.	Run-off in second-feet per square mile.	Period.	Run-off in second-feet per square mile.
Six week days	December 14–19, 1903.	727	0.17	January 25–30, 1904.	a 617	0.22	November 30 to December 5, 1903.	0.36
One month	February, 1904	921	.22	February, 1904	680	.24	November, 1903.	.44
Three months	December, 1903, to February, 1904.	1,095	.26	January to March, 1904.	763	.27	October to December, 1903.	b .51
Six months	September, 1903, to February, 1904.	1,530	.36	October 13, 1903, to March, 1904.	1,119	.40		
Twelve months	April, 1903, to March, 1904.	4,373	1.02	April, 1903, to March, 1904.	3,506	1.26		

a Average of three days during this week.
b Fifteen days in December.

The following table shows very clearly the effect of storage in increasing flow during the period from September to November, inclusive, which would probably have been the time of lowest water under natural conditions of flow:

Low-water discharge, in second-feet per square mile, of Kennebec River at Waterville, Me., with and without storage.

Lowest or lowest successive—	Period.	Estimated flow without storage.	Observed flow with storage.
Calendar month	September, 1903	0.16	0.59
Three months	September to November, 1903	.19	.46
Six months	September, 1903, to February, 1904	.22	.36

A

B

"FRESHET OAK," KENNEBEC RIVER AT WINSLOW, ME.

A, During flood of December, 1901; *B*, After flood of December, 1901.

LOW-WATER CONDITIONS ON TRIBUTARIES OF KENNEBEC RIVER.

The following table gives the lowest observed flow for various lengths of time during the period since gaging stations were established on the Moose, Roach, Dead, Carrabassett, Sandy, Messalonskee, and Cobbosseecontee. It must be kept in mind that winter records are not in general available for these stations, and consequently the figures given may not represent the true minima for the given lengths of time during this period, which for the first four stations began in 1902 and for the other three as noted in the table. In the latter part of 1903 very low water conditions existed.

Low-water discharge, in second-feet per square mile, of tributaries of Kennebec River.

Lowest or lowest successive—	Moose River at Rockwood (drainage area 680 square miles).		Roach River at Roach River (drainage area 85 square miles.)		Dead River at The Forks (drainage area 870 square miles).		Carrabassett River at North Anson (drainage area 340 square miles).	
	Period.	Discharge.	Period.	Discharge.	Period.	Discharge.	Period.	Discharge.
Six week days	March 26–31, 1906.	0.13	November 13–18, 1905.	0.01	October 12–17, 1903.	0.15	September 23–28, 1903.	0.19
One month	October, 1903	.15	October, 1905	.32	October, 1903	.20	September, 1903.	.32
Three months	October to December, 1903.	[a] .17	October to December, 1903.	.32	September to November, 1903.	.29	September to November, 1903.	.46

Lowest or lowest successive—	Sandy River at Madison [b] (drainage area 650 square miles).		Messalonskee Stream at Waterville [c] (drainage area 205 square miles).		Cobbosseecontee Stream at Gardiner [d] (drainage area 240 square miles).	
	Period.	Discharge.	Period.	Discharge.	Period.	Discharge.
Six week days	October 2–7, 1905	0.08	December 14–19, 1903	0.23	October 23–28, 1899	0.27
One month	October, 1905	.14	November, 1903	.29	November, 1891	.34
Three months	October to December, 1905.	.32	October to December, 1903.	.35	October to December, 1899.	.46

[a] Sixteen days in December.
[b] Sandy River station established in 1904.
[c] Messalonskee Stream station established in 1903.
[d] Cobbosseecontee Stream station established in 1890.

WATER POWER.

DEVELOPED WATER POWERS.

The following brief descriptions of developed water powers in the Kennebec basin are based for the most part on data furnished by letters from the mill owners and users of power. This is supplemented where possible by the information obtained from time to time by the hydrographers of the United States Geological Survey, in connection with their regular trips to gaging stations. Every effort has been made to avoid errors, but it must be realized that these descriptions have to be based largely on reports made up by persons who are not in general experienced in reporting such data, and some inaccuracies are bound to exist.

KENNEBEC RIVER.

The uppermost of the developed water powers on the Kennebec is that of the International Paper Company at Carritunk Falls, near Solon. There is a natural fall at this point of about 28 feet through a narrow gorge, above which the river widens out. The dam was built in 1891 and affords an average head of about 29 feet. Turbines aggregating about 3,000 horsepower are installed, and the power is used in the manufacture of ground wood pulp. This dam ponds the water for about 2 miles upstream.

The next utilized power downstream is that at Madison, which is used by the Great Northern Paper Company for manufacturing paper, ground wood pulp, and sulphite fiber; by the Indian Spring Woolen Company and the Madison Woolen Company for manufacturing woolen goods, and by the Madison pumping station for pumping the town water supply. The two woolen companies use about 400 horsepower each, the pumping station a small amount, and the balance is taken by the paper company, which uses about 1,200 electrical horsepower at all times, and has in addition grinder units that require a maximum of about 200 horsepower. The electric plant is run throughout the year at full capacity and the grinders perhaps average half power throughout the year. The dam at Madison ponds water nearly up to the mouth of Carrabassett River, a distance of about 5½ miles.

The next dam is at Skowhegan, where the power is controlled by the Skowhegan Water Power Company. A head of 18 to 20 feet is obtained, and 28 wheels aggregating a capacity of 5,100 horsepower are in use. Of this amount, 2,900 horsepower is employed in the manufacture of pulp, 750 horsepower for electric lights and power, and the remainder by grist, saw, planing, and woolen mills and a sash and blind factory. Some of the wheels operate factories by day and electric lights by night. The dam ponds water to about 1 mile above Norridgewock, a total distance of about 6 miles.

At the village of Shawmut, in the town of Fairfield, is a dam affording a fall of about 12 feet, owned by the Shawmut Manufacturing Company. The power is utilized by pulp mills, an electric-light plant, a furniture factory, and a woolen mill. This dam ponds water 7 or 8 miles upstream, or considerably more than halfway to Skowhegan.

At Fairfield is a log dam about 1,300 feet long, with a total fall of 11 feet. This dam is owned by the Fairfield Junction Mills and

Water Power Company, and furnishes power for two sawmills and a planing mill. There are eight or ten wheels, developing about 1,000 horsepower. This dam ponds water to the foot of the Shawmut dam, a distance of about 3 miles.

At Winslow are the dam and mills of the Hollingsworth & Whitney Company (privilege formerly known as the College Rapids). This company manufactures manila paper and ground wood and sulphite pulp. A fall is obtained of about 23 feet. There are 46 turbines with an aggregate capacity of about 8,500 horsepower, in addition to 2,000 horsepower of auxiliary steam. This dam ponds water to the foot of the Fairfield dam, a distance of about 2½ miles.

At Ticonic Falls, between Waterville and Winslow, are the cotton mills of the Lockwood Company, about 2,400 horsepower being used. A dam 750 feet long raises the river surface 7 feet, and a further natural fall of about 13 feet on a slate ledge gives a total fall of 20 feet. This dam ponds water to the foot of the Hollingsworth & Whitney dam, a distance of about 1 mile upstream.

At Augusta, at the head of tide water, is a timber-crib dam affording ordinarily a head of 17 feet. On the west bank the Edwards Manufacturing Company uses about 2,500 horsepower for its cotton mills; on the east bank 1,500 horsepower is used by the Cushnoc Paper Company and the Kennebec Light and Heat Company, the latter furnishing the municipal lights of Augusta, Hallowell, Gardiner, and Togus. The fall at this dam is affected somewhat by the rise of tide. At ordinary stages the water is ponded by the dam for about 12 miles upstream, or about three-fourths of the way to Winslow and Waterville.

DEAD RIVER.

There are no water powers of importance on Dead River; on North Branch at Eustis is a dam affording a head of 8 feet, used for a lumber and grist mill; on South Branch at Stratton is also a small developed power.

CARRABASSETT RIVER.

At Kingfield is a dam affording a head of 10 to 12 feet, used for lumber and planing mills and the manufacture of rakes, cant dogs, cotton-mill rolls, etc. Wheels aggregating about 170 horsepower are installed, about half of which can be run during the low-water season.

At East New Portland the Carrabassett Stock Farm Company owns a privilege affording a head of 15 to 26 feet, used for a sawmill and electric-light plant, with three wheels rated at a total of 465 horsepower. Auxiliary steam (75-horsepower boiler) is also used.

At North Anson just above the Somerset Railway bridge a dam affording a head of about 9 feet is used by the North Anson Lumber Company for a sawmill. One wheel is installed, rated at 110 horsepower, 70 per cent of which is available at low water. A short distance downstream, near the entrance of Mill Stream, a dam is being constructed (1906) to utilize the flow of both Carrabassett River and Mill Stream. A paper and pulp mill of the American Pulp, Paper and Lumber Company will be placed on the right bank and utilize practically all of the undeveloped fall at North Anson, amounting to about 40 feet.

On the tributaries of Carrabassett River are a few small developments, principally at North and West New Portland.

SANDY RIVER.

At Phillips is a dam affording a head of 20 feet, used for a sawmill and electric-light plant; two wheels are installed, rated at 125 horsepower; the low-water flow, lasting usually about a month, is good for 40 or 50 horsepower.

At Fairbanks is a developed privilege.

At Farmington is a dam affording a fall of about 7 feet, used for a lumber mill.

At Farmington Falls a dam gives a head of 8 or 9 feet, used in manufacturing carriages, sleighs, etc.

At New Sharon a fall of 10 feet is utilized for the manufacture of shoes and shoe boxes.

Near Madison, a few miles from the mouth of the river, is a masonry dam, affording a fall of 15 feet, used for electric light and power. (See p. 87 for additional details of this plant.)

SEBASTICOOK RIVER.

At Hartland, on West Branch, are two dams, the upper affording a head of about 6 feet and operating two wheels for a lumber and planing mill, which uses half the flow. The remaining water is carried farther downstream, and discharged under a head of 16 feet, with a second dam providing a fall of about 11 feet, used by the Linn Woolen Company for the manufacture of shawls, rugs, dress goods, etc. This company has about 180 horsepower of wheels and 150 horsepower of auxiliary steam.

At Pittsfield, on West Branch, is a dam affording a head of about 11 feet, utilized by the Waverley Woolen Company, which has three wheels aggregating 300 horsepower and 250 horsepower of auxiliary steam (used only in times of very low water). About half a mile farther downstream is a privilege affording a fall of about 10 feet; one-third of the flow at this point is utilized by the Smith Woolen Company (one wheel of 60 horsepower and auxiliary steam of 85 horsepower), and the remainder by Robert Dobson & Co., manufacturers of woolen goods, who have 150 horsepower of wheels and 215 horsepower transmitted electrically from the Sebasticook Power Company's plant near Burnham.

At Corinna, on East Branch, is a dam affording a head of 10 feet, used for a flour and grist mill, with wheels of about 90 horsepower installed.

At Newport, on East Branch, is the plant of the Newport Woolen Company, which utilizes a fall of about 10 feet, with 135 horsepower of wheels and 75 horsepower of auxiliary steam.

At Detroit, on East Branch, is a dam with head of about 12 feet, used for a lumber mill, with turbines of 250 horsepower.

Near Burnham Junction, on the main river, is a timber-crib dam with masonry abutments, built in 1903, giving a head of about 27.5 feet. This is owned by the Sebasticook Power Company and used for generating light and power to be transmitted, mostly to Pittsfield at present. The plant is not yet fully developed; three pairs of wheels are installed, rated in the aggregate at about 800 horsepower, and the company has 400 horsepower of auxiliary steam. The minimum flow at this point is considered to be good for 1,200 horsepower.

At Clinton is a dam affording a head of about 6 or 8 feet, used for flour and grist and lumber mills. Wheels of about 200 horsepower are installed.

At Benton Falls a fall of 25 feet is utilized by the United Box Board and Paper Company, which has wheels of about 800 horsepower installed and manufactures wood-pulp board.

MESSALONSKEE STREAM.

There are several dams affording slight falls between the various lakes in the headwaters of Messalonskee River—at Smithfield, between East and North ponds (7-foot fall); at Belgrade Mills, between Great and Long ponds (9-foot fall), etc.

At Oakland the following powers have been developed: (1) A dam at the foot of Messalonskee Lake, with 8-foot fall, utilized for woolen mill, pumping station, and ax factory; (2) a dam with 12-foot fall, used for scythe and ax factory, machine shop, and shoddy mill; (3) a dam with 14-foot fall, two 48-inch Hercules wheels, used for ax, scythe, and tool factory; (4) a dam with 40-foot fall, 600 horsepower of wheels used by Messalonskee Electric Company and about 100 horsepower for scythe forge shop; (5) a dam with 18-foot fall, 150-horsepower wheel used by Cascade Woolen Mill, the balance unused. The last three privileges are owned by the Dunn Edge Tool Company.

A dam with a fall of about 14 feet is used for pumping the Waterville municipal water supply, which comes by gravity flow from China Lake. Just below is the dam of the Chase Manufacturing Company, with a fall of about 8 feet. (See p. 90 for further description of this plant.) About a mile farther downstream, a short distance from the mouth of the river, is a masonry dam affording a fall of about 40 feet, owned by the Waterville Gas and Electric Company and used for electric light and power.

COBBOSSEECONTEE STREAM.

There are developed privileges at Readfield, Winthrop, and Monmouth.

Between Cobbosseecontee Pond and Gardiner are two developed privileges, which, however, are not of much value for power because at times all the water is shut back for storage purposes in the ponds.

At Gardiner there are seven dams controlled by the Gardiner Water Power Company. They afford a total fall of 128 feet, used as indicated in the following table:

Developed water powers at Gardiner, Me.

Owner.	Use.	Fall.	Horsepower.
		Feet.	
Gardiner waterworks	Pumping station	9	(a)
S. D. Warren & Co	Paper mill	37	[b] 1,050
Hollingsworth & Whitney Co	do	17	
Do	do	16	
Do	do	16½	
Joshua Gray & Son	Lumber mill	12½	
Gardiner estate	Various small industries	15-20	

[a] See p. 93 for further description of this plant. [b] 2 wheels.

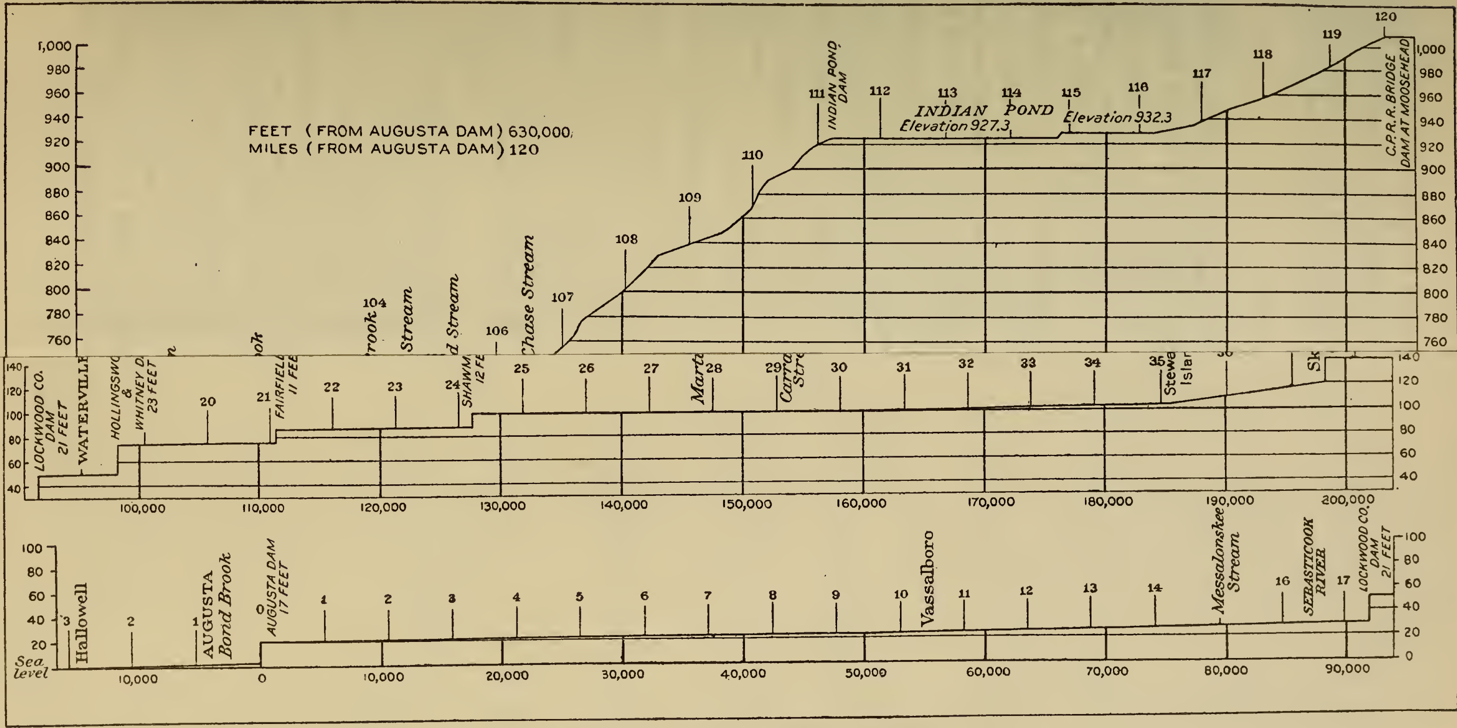
UNDEVELOPED WATER POWERS.

GENERAL CONSIDERATIONS.

In 1882 Swain[a] called attention to the large amount of excellent undeveloped power on the Kennebec River and its tributaries. Since that time many important plants have been constructed—notably those at Waterville, Fairfield, Madison, and Solon on the main river and numerous smaller developments on the tributary streams. There is still, however, especially in the more northerly portions of the basin, an immense amount of unutilized power. Of the 1,026 feet fall on the main river between Moosehead Lake and tide water only about 153 feet are developed. A condensed profile of Kennebec River is shown on Pl. IV; a plan and a more detailed profile can be obtained by addressing the Director of the United States Geological Survey, Washington, D. C.

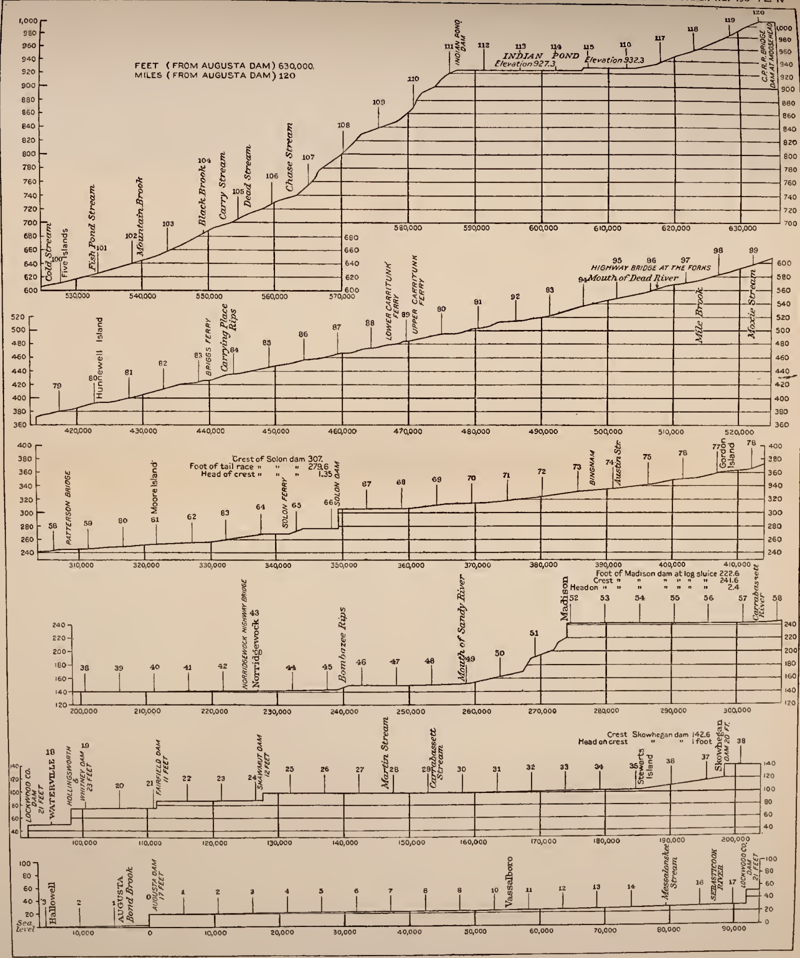
Brief descriptions follow of some of the more important unutilized water privileges. For the main stream and for Moose, Roach, and Dead rivers these are based on surveys and reconnaissances of the

[a] Swain, G. F., Report on water powers: Tenth Census, vol. 16, pt. 1, 1885, pp 83-89.



PROFILE OF KENNEBEC RIVER.

Corrected according to revised datum of 1906, by adding 2.6 feet to all elevations.



PROFILE OF KENNEBEC RIVER.

Corrected according to revised datum of 1906, by adding 2.6 feet to all elevations.

United States Geological Survey from 1904 to 1906; for the principal tributaries such topographic atlas sheets as are available were consulted, and the facts they furnished were supplemented by information obtained chiefly through correspondence.

KENNEBEC RIVER.

Between Moosehead Lake and Indian Pond there is a drop of nearly 100 feet distributed rather evenly over a distance of about 3½ miles.

For about 7 miles below Indian Pond the river is very precipitous, falling approximately 250 feet. Much power could be developed here. The banks are high with rocky walls and there are many excellent dam sites. In the remaining 8 miles to the mouth of Dead River at The Forks, the fall is a little less steep, amounting to about 120 feet. The conditions in general are good, however, for power development.

From The Forks to Bingham the fall is in general fairly uniform, amounting to 230 feet in a distance of about 22 miles. At only a few places in this stretch are there rapids other than those produced by the general slope of the river. The most promising place for power development is perhaps near Carrying Place Rips, about 10 miles above Bingham, where there is a fall of about 9 feet in half a mile; but this location is not especially favorable for a dam. This entire section of the river, however, will be in time of great value for power purposes.

From Bingham down to the Solon dam the fall is considerably less than in the stretch of the river just described, amounting to only about 30 feet in a distance of 5 miles to the Solon mill pond. Between the foot of the Solon dam and Solon Ferry, a distance of 1½ miles, is a fall of about 8½ feet. The total fall between the foot of the Solon dam and the mouth of Carrabassett River, which marks the practical extent of pondage from the Madison dam, is about 36 feet in a distance of 9 miles.

At Madison, between the present dam and the mouth of Sandy River, a distance of a little less than 3 miles, there is a fall of about 68 feet in pitches and rapids where some excellent undeveloped power exists. (See Pl. VII, *B*, p. 162.) The Great Northern Paper Company has prepared plans for the development of practically all of this fall by the use of two dams—one developing 43 feet and the other 20 feet.

At Bombazee Rips, about 2½ miles above Norridgewock, there is a fall of 7½ feet in one-fourth of a mile. Near the head of the rips is a good ledge foundation for a dam, and probably a 10 or 12 foot head could be obtained here without difficulty. Just below Skowhegan there are 18 or 20 feet of undeveloped fall in a distance of about 2½ miles. The remainder of the river is entirely developed.

MOOSE RIVER.

Holeb Falls, about 16 miles by river below the outlet from Holeb Pond, give a fall of 20 to 30 feet. Upstream for about 8 miles the fall is slight, so that good pondage could be had here. Mosquito Rips (4 feet fall), Spencer Rips (5 feet fall), and Attean Falls (10 feet fall) occur in the remaining stretch of river to the head of Attean Pond. The total distance from Holeb Outlet to Attean Pond is about 29 miles. Between Attean, Wood, and Long ponds there is but little fall. Below Long Pond the fall is very steep, being about 110 feet in a distance of 4 miles to Little Brassua Lake, which is practically at the level of Brassua Lake. This stretch flows over a very rough and rocky bed and there are several good sites for dams. (See Pl. V, *B*.) Between Brassua and Moosehead lakes is a drop of about 20 feet at ordinary stages. By placing a dam near the Rockwood gaging station of the United States Geological Survey this fall could be practically all utilized and in addition any further amount resulting from the raising of the Brassua Lake level to procure additional storage. (See p. 134.)

ROACH RIVER.

There is a little fall on Roach River above Lower Roach Pond—perhaps 30 feet to Middle Roach Pond. Between Lower Roach Pond and Moosehead Lake, a distance of some 5 miles, the fall is about 75 feet.

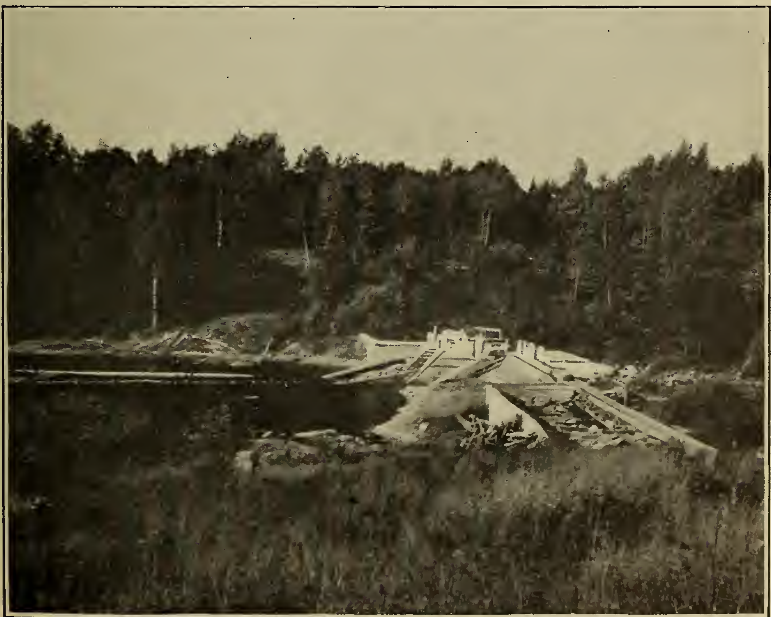
MOXIE STREAM.

There is a total fall of 370 feet between Moxie Pond and Kennebec River, a distance of about 4 miles, and this occurs practically all in the lower 2 miles. At Moxie Falls there is a nearly vertical drop of 95 feet near the main river.

DEAD RIVER.

At Arnolds Falls about 5 miles below Flagstaff there is a fall of about 12 feet in one-fourth of a mile. At Hurricane Falls, 4 miles above Dead River, there is a fall of 8 feet in one-eighth of a mile. From 10 to 12 feet fall could be developed, but the pondage would be small, unless the intervale land was flooded. Long Falls, 6 miles below Dead River Plantation, extends over a distance of about a mile, with a total fall of about 72 feet, the main part being made up of a series of precipitous falls occurring in a short distance. Excellent sites exist for a dam, as the river banks are of ledge, and a 40-foot head could be easily developed. At Grand Falls, one-fourth mile below the Dead River dam and about 12 miles from The Forks, is a precipitous drop of 28 feet. The banks are high and of ledge, affording an excellent opportunity for a dam; a 40-foot head could

A. HEAD-GATES AT EAST OUTLET OF MOOSEHEAD LAKE.



B. LONG POND DAM ON MOOSE RIVER.

be easily developed. Dead River Rapids extend from Grand Falls to The Forks, with a total fall of about 400 feet in the 12 miles. No precipitous falls occur, but for the most part a gradual descent is maintained, there being a succession of very rocky rapids with short stretches of connecting quick water. The river banks are for the most part high and ledges are numerous affording opportunities for dams at nearly all of the rapids.

The following table gives an approximate profile of Dead River, based on a barometric reconnaissance during 1906.

Elevations along Dead River.

[Datum is mean tide.]

Place.	Elevation above mean sea level.	Approximate distance from Flagstaff.
	Feet.	*Miles.*
Flagstaff	1,082	
Dead River	1,072	10
Outlet of West Carry Pond	1,072	14½
Head of Long Falls	1,072	16
Foot of Long Falls at Black Brook	1,000	17
Outlet of Spring Lake	1,000	18¾
Dead River dam (present water surface)	1,000	23
Dead River dam (top gates)	1,011	23
Dead River dam (foot of Grand Falls)	963	23¼
Mouth of Spencer Stream	957	23½
Junction of Spencer and Little Spencer streams	984	
Mouth of Enchanted Stream	760	29
Junction with Kennebec	565	36

PLEASANT POND STREAM.

Pleasant Pond Stream falls about 780 feet between Pleasant Pond and Kennebec River, a distance of 3½ miles, but the tributary drainage area is only a few square miles.

PIERCE POND OUTLET.

Pierce Pond Outlet falls about 640 feet in a distance of 3 miles from Pierce Pond to Kennebec River. The drainage area at the outlet of the pond is small, being only about 18 square miles. The possibility of bringing Dead River water to Pierce Pond and thus utilizing the large drop to Kennebec River in one fall has been investigated. Pierce Pond lies at about 1,125 feet above tide (by aneroid from Carritunk), and a comparison of this elevation with those given for Dead River in the foregoing table indicates the impossibility of carrying out this scheme without great expense, as to reach the Pierce Pond elevation it would be necessary to pond the water in Dead River to a point above Flagstaff.

CARRABASSETT RIVER.

There is considerable undeveloped fall in the upper part of Carrabassett River and on its tributaries, but the supply of water is in general too small to warrant developments. At Cleveland Rips, 3 or 4 miles above North Anson, is an undeveloped fall said to be about 12 feet.

SANDY RIVER.

Considerable undeveloped fall exists on Sandy River. There is said to be a good privilege just below New Sharon that will afford a fall of about 30 feet. At Davis Ferry, in the town of Stark, is a power site with perhaps a 15-foot fall. At Strong, and farther up the river, there is considerable unutilized fall, but the volume of water available in low-water seasons is small.

SEBASTICOOK RIVER.

Sebasticook River is one of the most fully developed for power of all the tributaries of the Kennebec. Of the 170-feet fall between Moose Pond and Kennebec River about 100 feet are developed. It is said that at Fifteenmile Rips, about 3 miles above Clinton, a good site exists to obtain a fall of about 12 feet. At Winslow, about half a mile below the entrance of China Lake Outlet, near the mouth of the river, is an undeveloped privilege owned by the Fort Halifax Paper Company, of Waterville, that is reported to be capable of affording a 24-foot head and "a mean low run of 450 to 550 cubic feet per second."

MESSALONSKEE STREAM.

Of the 210-feet fall between Messalonskee Lake and Kennebec River about 135 feet are developed. A good unutilized site remains just below Oakland, where a head of about 47 feet can be obtained. This is owned by the Messalonskee Electric Company. The large amount of lake area in this drainage basin is of great value in rendering the flow uniform, but the storage capacity of the lakes should be increased and more care given toward regulation of flow.

WEBER POND OUTLET.

Weber Pond Outlet falls about 115 feet in 3½ miles—mostly in the last 2 miles—from Weber Pond to Kennebec River.

COBBOSSEECONTEE STREAM.

Cobbosseecontee Stream is rather fully developed, but a few unutilized sites remain above Cobbosseecontee Pond. This is a stream of very even flow, owing to its excellent storage reservoirs.

WATER STORAGE.

GENERAL CONSIDERATIONS.

No other tract of country of the same extent on the continent is so well watered—that is, supplied with well-distributed lakes and streams—as is the State of Maine. Of the three largest drainage basins in the State—the Kennebec, Penobscot, and Androscoggin—the Kennebec is first as regards the proportion of lake and pond surface to total drainage area, which for this river is about 1 to 14. (See p. 144.) Moreover, Moosehead Lake furnishes one-third of this water-surface area in the Kennebec basin and constitutes one of the most valuable reservoirs for water storage and control in the country. The drainage area tributary to Moosehead Lake is large—about 1,240 square miles—so that even the great storage capacity afforded by a depth of 7.5 feet (the present head) on this lake is not nearly sufficient to prevent considerable losses of water at times.

The importance of storing and regulating the flow of Kennebec River has long been realized by the water power and lumbering interests along the river. To a certain extent these interests of necessity conflict in regard to the manner of use of stored water. The log-driving season begins in the early spring, the small streams in the headwaters being first driven and the logs temporarily held in various lakes and ponds. Eventually the main drive leaves Moosehead Lake, and it is usually well into the summer before the last of the logs reach their destination on the lower river. To drive the logs, especially in the portion of the river between Moosehead Lake and Bingham, a certain amount of flow is required to prevent the rapid formation of jams, and the practice is to let out each day from Indian Pond dam (this pond being used as a regulating reservoir for flow from Moosehead Lake) a head, or "hoist," as it is called, of water to help sluice along the drive. Formerly little or no care was taken to prevent the waste of water during log driving, with the result that frequently by the end of the log-driving season little water would be left stored in Moosehead Lake, and consequently the water-power users on the river suffered from a scarcity of water in the fall and early winter, receiving almost no benefit from the use of Moosehead Lake for storage. In late years, however, the log-driving and water-power interests on the river have become more harmonious, and the two associations representing them—the Kennebec Log Driving Association and the Kennebec Water Power Company—are to a large extent made up of the same persons. Efforts are being made not only to prevent the needless waste of water in log driving, but to improve the river channel and facilities for driving, so as to require less water for this purpose. The necessity of providing additional storage capacity over that now utilized at Moosehead Lake has been apparent for several years, and surveys of the lake have been made by the water-power company to ascertain the feasibility of further raising the lake level.

As a result of the cooperation between the Maine State Survey Commission and the United States Geological Survey, surveys of various lakes and ponds in the Kennebec headwaters were made during 1905–6 by the National Survey. Sufficient information has been thus obtained, in addition to that relating to Moosehead Lake furnished by the Kennebec Water Power Company, to serve as a basis for a fairly comprehensive study of the problem of additional storage, and in the succeeding pages the various possibilities will be discussed. The following plans and profiles will be furnished to persons especially interested in the subject on application to the Director, United States Geological Survey, Washington, D. C.:

Plan of Brassua Lake.
Plan of Brassua Lake Outlet.
Plan and profile of Moose River between Moosehead and Brassua lakes.
Plan of Wood and Attean ponds.
Plan of Wood Pond Outlet.
Reconnaissance plan of Holeb Pond, Long Pond, Lower Roach Pond, Middle Roach Pond, Flagstaff Lake, West Carry Pond, Spring Lake, and Spencer Ponds.

STORAGE IN KENNEBEC HEADWATERS.

MOOSEHEAD LAKE.

Moosehead Lake, with an area of about 115 square miles, is the largest lake in New England. It is about 35 miles in extreme length, 12 miles in maximum width, and of such depth that it is crossed by steamboats from end to end. It has long been used as a reservoir to store the spring flow for use in log driving and for power, and is commanded by substantial log-crib dams at its two outlets. That at the east or principal outlet, shown in Pl. V, *A*, was completed in 1901, replacing an old dam. The west-outlet dam was rebuilt in 1904. Most of the regulation of flow, however, is carried on at the east-outlet dam, and in general little water flows by way of the west outlet. The west-outlet stream joins the main river at the upper end of Indian Pond.

The present head of water obtainable on Moosehead Lake is about 7.5 feet. (See list of gage heights of Moosehead Lake, pp. 70–76.) The Kennebec Water Power Company has made surveys of the present lake shores with the view of obtaining additional storage capacity corresponding to an increased depth of 2 feet, and has spent about $16,000 for these surveys and mapping. The results indicate that an increase in water surface of about 1.6 square miles would result from this proposed rise in level. The shores are in general high and rocky, but in several places rather low, so that the estimated damages are on the whole considerable. It is probable that Moosehead Lake could be drawn down considerably below the present limit, if dredging were done at the outlet, but this would of course have an objectionable effect on the navigability of the lake.

The data furnished by the Kennebec Water Power Company have been used in compiling the following table, which shows the present storage capacity and that obtainable by raising the lake level 2 feet.

Area and capacity of Moosehead Lake at different elevations.[a]

[Drainage area at outlet, 1,240 square miles.]

Gage height.	Area of water surface.	Capacity of section.	Total capacity above gage height 0.0 foot.
Feet.	*Sq. miles.*	*Cubic feet*	*Cubic feet.*
0.0	111.3		
1.0	111.9	3,110,000,000	3,110,000,000
2.0	112.4	3,127,000,000	6,237,000,000
3.0	113.0	3,142,000,000	9,379,000,000
4.0	113.6	3,158,000,000	12,537,000,000
5.0	114.3	3,176,000,000	15,713,000,000
6.0	114.9	3,195,000,000	18,908,000,000
7.0	115.6	3,213,000,000	22,121,000,000
7.5	116.0	1,614,000,000	23,735,000,000
8.5	116.8	3,245,000,000	26,980,000,000
9.5	117.6	3,267,000,000	30,247,000,000

[a] Gage heights refer to lake datum, the zero of which is approximately at the elevation of the gate sills, or 1,021.30 feet above mean sea level.

MOOSE RIVER BASIN.

Moose River and its series of lakes, comprising Brassua Lake and Long, Wood, Attean, and Holeb ponds, afford some excellent opportunities for storage of water. The natural and artificial conditions in the vicinity of these ponds are in general favorable for their utilization for storage without great cost, but at present only one of them (Long Pond) is controlled by a dam, and this is utilized solely for log-driving purposes. (See Pl. V, *B* p. 128.) The following descriptions of the Moose River lakes and ponds are based on data obtained by the United States Geological Survey during 1905–6. as previously explained.

BRASSUA LAKE.

Brassua Lake is approximately rectangular in shape, running northwest to southeast, about 5.5 miles long and 1.4 miles in maximum width. Its greatest depth is about 35 feet, in the extreme northwestern part of the lake; the more shallow portions lie at the southeastern extremity along Miseree Sands. It has an area of 5.55 square miles at an elevation of 1,043.0 feet above mean tide. The shores are wooded and as a rule are high, the low areas being around the entering streams—Miseree Stream at the southeast, Moose River at the south, and Brassua Stream at the northern extremity. No dam now exists at the outlet of the lake.

This lake could readily be raised 10 or 15 feet, or even more, above the present low-water level, without doing any damage except to timber standing on the flooded area, but as this is mostly young growth the total damage would be small. There are several good sites for a dam at the outlet of the lake. As a rule the river bed here is rocky or of gravel and in places rather rough.

A dam with crest at elevation 1,056 feet, placed near the outlet, with a total length of about 850 feet and a maximum height of 20 to 25 feet would afford about 18 feet head of water.

About 1.3 miles below the outlet, just below the United States Geological Survey gaging station, is a site for a dam which would not only afford lake storage but would develop a fall of about 25 feet and flood out the rough section of the river intervening, which causes considerable trouble in log driving. A dam here would be about 1,000 feet in total length and about 35 feet in maximum height, if its crest were set at elevation 1,056 feet.

The following table gives the area and approximate storage capacity of Brassua Lake at various elevations:

Area and capacity of Brassua Lake at different elevations.

[Drainage area at outlet, 675 square miles.]

Elevation above mean sea level.	Area of water surface.	Capacity of section.	Total capacity above elevation 1,038 feet.
Feet.	*Sq. miles.*	*Cubic feet.*	*Cubic feet.*
1,038	4.45		
1,039	4.66	127,000,000	127,000,000
1,040	4.87	133,000,000	260,000,000
1,041	5.08	139,000,000	399,000,000
1,042	5.30	145,000,000	544,000,000
1,043	5.55	151,500,000	695,500,000
1,044	5.80	158,500,000	854,000,000
1,045	6.05	165,000,000	1,019,000,000
1,046	6.35	173,000,000	1,192,000,000
1,047	6.65	181,000,000	1,373,000,000
1,048	7.00	190,500,000	1,563,500,000
1,049	7.37	200,000,000	1,763,500,000
1,050	7.85	212,000,000	1,975,500,000
1,051	8.37	236,000,000	2,211,500,000
1,052	8.85	240,500,000	2,452,000,000
1,053	9.20	252,000,000	2,704,000,000
1,054	9.50	261,000,000	2,965,000,000
1,055	9.80	269,000,000	3,234,000,000
1,056	10.12	278,000,000	3,512,000,000
1,057	10.45	287,000,000	3,799,000,000
1,058	10.70	295,500,000	5,094,500,000

LONG POND.

Long Pond runs approximately from northwest to southeast and is long, narrow, and irregular in shape. Its extreme length is about 10 miles, 8 miles being the pond proper and the remainder the former river channel, in which water is held by the dam. During low water there is a fall of perhaps 2 or 3 feet between these two portions. The width of the pond varies from 300 feet at the Lower Narrows to

$1\frac{1}{2}$ miles opposite the mouth of Parlin Stream. Its maximum depth is about 35 feet, and it has a pond surface of 4.8 square miles at an elevation of 1,159 feet.

The shores are wooded, as a rule, with some bordering farm land toward the northern extremity. Around the upper end the ground is low and marshy; the remainder of the shore rises gradually. The Canadian Pacific Railway runs along the entire southern shore, being but little above the pond in elevation. The lowest portion of the track is just west of Parlin Stream, where the elevation is about 1,165 feet; at several other places the elevation is from 1,166 to 1,170 feet.

The existing dam is an old timber-crib structure, 385 feet in total length. It has two wing walls, one 43 feet and the other 170 feet long, and the dam proper is 172 feet long, with 14 sluices and gates. (See Pl. V, *B*, p. 128.) The elevation of the bottom of six sluices is about 1,157 feet; of the log sluice, 1,152.2 feet; and of the remaining sluices, about 1,151.2 feet. The elevation of the wing wall on the south, at which water will go to waste, is about 1,160 feet. The dam is now used for holding back water in the spring for a short time during the log-driving season; after that the gates are open and free flow takes place.

On account of the proximity of the Canadian Pacific Railway, perhaps no increase in the height of the dam is warranted, but to utilize the storage a higher summer level could be maintained. The present low-water level is about 1,152 feet at the dam, or probably about 1,154 or 1,155 in the pond proper. In the spring the water is maintained for a short time in the pond at an elevation of over 1,160 feet, and an elevation of 1,160 feet could probably be maintained without doing much damage. If the present average low-water level is considered as elevation 1,155 feet, and the average area 4.5 square miles, the capacity at elevation 1,160 feet would be about 625,000,000 cubic feet. It is probable that this quantity could be considerably increased by dredging at the narrows and lowering the gate sills at the dam. The drainage area at the outlet of the pond is 520 square miles.

WOOD AND ATTEAN PONDS.

Wood Pond is situated in the town of Jackman at an elevation at low-water level of about 1,157 feet. It is connected with Long Pond by about 7 miles of very crooked river, in which the fall is about 2 feet under average conditions. The pond is irregular in shape, 3.8 miles in extreme length and $1\frac{3}{4}$ miles in maximum width. A considerable portion of it is more than 30 feet in depth. The shores are wooded and steep, with practically no bordering flat land.

Attean Pond is connected with Wood Pond by about three-fourths of a mile of river and under normal conditions is at the same level as Wood Pond. It will thus be noted that Long, Wood, and Attean ponds are all at about the same elevation. Attean Pond is very irregular in shape, 5 miles long, 2 miles in maximum width, and about 30 feet in maximum depth. It contains many islands. The shores are wooded and high for the most part, the lowest land, which is under cultivation, being along the river connecting Wood and Attean ponds.

The Canadian Pacific Railway runs along a portion of the eastern shore of Wood Pond, crosses Moose River at its entrance into that pond, and then follows the northern shore of Attean Pond. Its lowest elevation is about 1,174 feet, just south of the bridge on Moose River.

A dam can be placed at the outlet of Wood Pond. Here the banks are high and of gravel, and the two ponds could be easily raised 10 feet by a dam 550 feet long. It is probable that water could not be drawn lower than about elevation 1,057 feet, owing to backwater influence from the river below; this would make a high-water elevation of 1,067 feet. Damage would be done to timber on the flooded land, and also to some farm land at the head of Wood Pond.

The drainage area of Wood Pond at its outlet is 320 square miles, and of Attean Pond 270 square miles. The following table gives the areas and capacity of Wood and Attean ponds at different elevations:

Area and capacity of Attean and Wood ponds at different elevations.

Elevation mean sea level.	Area of water surface.	Capacity of section.	Total capacity above elevation 1,157 feet.
Feet.	*Sq. miles.*	*Cubic feet.*	*Cubic feet.*
1,153	6.0		
1,154	6.6		
1,155	7.1		
1,156	7.3		
1,157	7.5		
1,158	7.7	211,900,000	211,900,000
1,159	7.9	217,500,000	429,400,000
1,160	8.0	223,000,000	652,400,000
1,161	8.0	223,000,000	875,400,000
1,162	8.2	225,800,000	1,101,200,000
1,163	8.4	231,400,000	1,322,600,000
1,164	8.6	237,000,000	1,569,600,000
1,165	9.0	245,300,000	1,814,900,000
1,166	9.4	256,400,000	2,071,300,000
1,167	10.0	270,400,000	2,341,700,000
1,168	11.1	295,500,000	637,200,000

HOLEB POND.

Holeb Pond, in the town of Holeb, is about 1 mile from Moose River, to which it is connected by Holeb Stream. It is irregular in shape, 3¾ miles long and 1⅛ miles in maximum width. The shores are wooded and high, except around the brooks and inlets entering the pond. The elevation of the low-water summer level is about 1,231 feet, and the area of the pond at this elevation is about 1.70 square miles; at elevation 1,241 feet the area of the water surface would be about 2.8 square miles. The Canadian Pacific Railway runs along the southern shore and crosses Holeb Stream just below the point where it leaves the pond, at an elevation of about 1,246 feet.

During the spring freshets, when Moose River is high, the backwater due to a ledge about 8 miles below Holeb Stream sets back to Holeb Pond, and at times has flooded the railroad tracks. This backwater causes the pond to act as a natural storage basin for a short time in the spring.

The only suitable place for a dam would be at the Canadian Pacific bridge, and could one be built here and an elevation of the lake surface of 1,241 feet maintained, the capacity of the lake above elevation 1,231 feet would be about 627,000,000 cubic feet. The drainage area of Holeb Pond at its outlet is about 24 square miles.

ROACH RIVER BASIN.

Roach River, with its three connected ponds, affords some opportunity for storage, although not as good as Moose River on account of its much smaller drainage area.

LOWER ROACH POND.

The present dam at Lower Roach Pond is as high as the surface of the surrounding ground will admit, and could not be raised without considerable expense because of the lowland. This dam controls about an 8-foot head, and, with an average area of 4.9 square miles, the present capacity is about 1,093,000,000 cubic feet. At present the summer pond level is but little above minimum low water, and a higher level could be maintained without doing any damage. It is probable, too, that this pond could be drawn down considerably lower by dredging and lowering the outlet. The drainage area at the outlet of the pond is about 85 square miles.

MIDDLE ROACH POND.

On Middle Roach Pond is a dam now controlling 6 feet of head. The average area of the pond is 1 square mile, and with the present dam the capacity is 167,000,000 cubic feet of water. The land is low around the dam, but with flashboards an increase in height of about 2 feet could be obtained without doing any material damage. This increase would add 67,000,000 cubic feet to the capacity.

SUMMARY OF STORAGE IN KENNEBEC HEADWATERS.

In the following table is a summary of the present and available storage in the upper portion of the Kennebec basin:

Summary of principal storage in Kennebec headwaters.

	Present storage.	Available storage.
	Cubic feet.	*Cubic feet.*
Moosehead Lake	23,735,000,000	30,247,000,000
Brassua Lake	0	3,512,000,000
Long Pond	625,000,000	625,000,000
Wood and Attean ponds	0	2,341,700,000
Holeb Pond	0	627,000,000
Lower Roach Pond	1,093,000,000	1,093,000,000
Middle Roach Pond	167,000,000	234,000,000
	25,620,000,000	38,679,700,000

STORAGE BELOW MOOSEHEAD LAKE.

MOXIE POND.

Moxie Pond, situated in The Forks and East Moxie townships, is about 4 miles from Kennebec River, to which it is tributary by Moxie Stream. It is long and narrow, about 8 miles in extreme length and three-fourths in maximum width, running approximately north and south. It has an area at low water of about 2.6 square miles. The shores are in general fairly high and steep, except near each end of the pond where there is considerable low ground. The shores are wooded, but mostly with small growth.

A timber-crib dam about 450 feet long controls a head of about 9 feet, at which level (about 969 feet above tide) the area of the water surface is about 3.0 square miles. This dam is used at present solely for log-driving purposes. The storage capacity of the pond is about 705,000,000 cubic feet. The outlet can be cut down about 2 feet and the dam raised 3 feet without great expense, and a total head of 14 feet obtained, corresponding to about 1,100,000,000 cubic feet capacity. To more nearly control the run-off from this drainage basin (80 square miles at the mouth of the pond) a dam 18 or 20 feet high would be required, furnishing a storage capacity of about 1,600,000,000 cubic feet. The most serious obstacle to raising the level of Moxie Pond any considerable amount is the proximity of the Somerset Railway extension, and the necessary changes involved in grading, etc., would add largely to the expense. On the other hand, the large amount of available water power on Moxie Stream, which has a fall of about 370 feet in practically 2 miles, makes any increase in the storage capacity of Moxie Pond of twofold value.

PIERCE POND.

Pierce Pond is located principally in Pierce Pond Township, about 3.5 miles west of Kennebec River, to which it is tributary by Pierce Pond Stream. It is very irregular in shape, being practically two ponds connected by a thoroughfare. It runs approximately north and south, and is 5 miles in extreme length, a little over a mile in maximum width, and in places rather deep. It has an area of about 2.3 square miles and the surface is approximately 1,125 feet above mean tide. The shores of the pond are wooded, mostly with young growth, and in the main are high with steep banks, but there are a few low places of small area.

A timber-crib dam, in rather poor condition, about 385 feet in total length, affords a head of 10 feet and a storage capacity of approximately 620,000,000 cubic feet.

The drainage area tributary to Pierce Pond is only about 18 square miles and any additional storage over the present amount is of doubtful value, although it could be obtained without great outlay. The thoroughfare between the two sections of the pond could be cut down with little expense, so that the northern part, in which at present there is a height of about 3.5 feet not utilized, would drain down within a foot of the outlet level. Pierce Pond would make an excellent storage reservoir if a greater area were tributary to it. The relative position of Pierce Pond with reference to Dead River is discussed on page 129.

DEAD RIVER BASIN.

Some very good opportunities exist for storage of water in the Dead River drainage basin, although as a rule the lakes and ponds do not have a large tributary area.

FLAGSTAFF LAKE.

Flagstaff Lake is in the town of Flagstaff, about half a mile north of Dead River, to which it is tributary. It is approximately rectangular in shape, running southeast and northwest, 2.5 miles in extreme length and 0.9 mile in maximum width, with an area of water surface of about 1.4 square miles, at an elevation of 1,100 feet above mean tide. It is a shallow lake, being not over 10 feet in maximum depth at medium stages. The shores are in general rather low.

A rough timber and bowlder-filled dam, situated about 2,300 feet down the outlet stream, controls a head of 12 feet, although considerably less than this amount is actually obtained, owing to the position of the gates. Power is used at this dam for running a sawmill. The storage capacity of Flagstaff Lake, with a depth of 12 feet and a water-surface area of 1.4 square miles, is about 470,000,000 cubic feet. This dam could not be raised more than 3 feet without flooding a part of the village of Flagstaff. A dam could, however, be placed 500 feet below the lake, or 1,800 feet upstream from the present dam, where the channel is about 100 feet wide and the stream has a rocky bed. With an increase in level of 10 feet a large storage capacity could be obtained, probably as much as 2,000,000,000 cubic feet. The drainage area at the outlet of Flagstaff Lake is about 50 square miles. The possibility of utilizing this lake as a storage basin for flow from the main river should be further investigated.

WEST CARRY POND

West Carry Pond is in the town of Carrying Place, about 4 miles east of Dead River, to which it is tributary. It is regular in shape, about 2 miles in extreme length and 0.8 mile in maximum width. In places it is more than 80 feet deep. It has a water-surface area of approximately 1.3 square miles, at an elevation of 1,250 feet above mean tide, or about 180 feet above Dead River. The shores are high and wooded.

A timber-crib dam at the outlet, 600 feet in total length, controls a head of about 10 feet, which would correspond to a storage capacity of about 360,000,000 cubic feet. This level could be easily raised 10 feet or more, but the tributary drainage area is only 15 square miles, and it is stated that water has never flowed over the present dam, so that no changes seem warranted.

SPRING LAKE.

Spring Lake, in T. 3, R. 4, lies about 1 mile west of Dead River, to which it is tributary. It is long and narrow, with two deep bays, 2.6 miles in total length, 0.75 mile in maximum width, and about 60 feet in maximum depth. The water-surface area is about 1.1 square miles, at an elevation of about 1,260 feet above mean tide, or 260 feet above Dead River. The shores are high and wooded.

No dam is situated at the outlet of this pond, although a head of 10 feet could be readily controlled. The drainage area is only about 10 square miles, and probably this lake will be of little value for storage unless the topography is such that adjacent streams can be readily turned into it.

DEAD RIVER DAM.

The Dead River dam was built in the autumn of 1905 by the Dead River Log Driving Company. It is situated about 1,400 feet above Grand Falls and half a mile above the entrance of Spencer Stream. It is a timber-crib structure having a total length of about 320 feet, with two log sluices and twenty gates. It is used solely for log driving and affords a head of 13 feet, flooding the river back to the foot of Long Falls. This, however, is only for a short time in the spring.

SPENCER PONDS.

The Spencer ponds are situated mainly in Hobbstown, about 5 miles north of Dead River, with which they are connected by Little Spencer and Spencer streams. They are known as Lower Basin, Upper Pond, and Fish Pond, and are connected by narrow thoroughfares. They are long and narrow, running approximately north and south. The total length is 6 miles and the maximum width, in the lower basin, 0.8 mile. The area of water surface is about 2.6 square miles, at an elevation of about 1,150 feet above tide, or 190 feet above Dead River at Spencer Stream. The shores are wooded and generally steep and high, except at the north end.

A timber-crib dam approximately 105 feet long at the outlet of Lower Basin controls a head of about 12 feet, although a bar in the stream above the dam prevents the utilization of the last foot of storage. This could be easily removed and would result in a storage capacity with the present dam of approximately 870,000,000 cubic feet. It is practicable to raise the level of these ponds 5 feet or more, depending on the quantity of water available. A total head of 16 feet would afford a storage capacity of about 1,500,000,000 cubic feet. The drainage area at the outlet of Lower Basin is about 46 square miles.

SPENCER STREAM DAM.

The Spencer Stream dam is a log-roll dam affording a head of about 9 feet, situated about 4 miles up Spencer Stream from the entrance of Little Spencer Stream. It makes several small ponds that are very quickly filled, affording frequently three or four heads per day during the log-driving season.

UPPER DEAD RIVER.

No additional data for Dead River above Flagstaff are available other than those given in the summary table on page 142. It is probable that considerable opportunity exists for storing water in this part of the river, and Chain of Ponds, Jim Pond, and Tim Pond appear to be worthy of investigation in this respect.

SUMMARY OF STORAGE.

The following table, summarizing the storage in the Kennebec basin, is taken mainly from Wells's report[a] and such corrections and additions have been made as are possible with the data at hand. In general, the areas of water surface in the lower part of the basin, as given by Wells, are approximately correct, but those in the middle and upper parts are too large. Corrections of Wells's figures are based on the topographic sheets or the results of surveys by the United States Geological Survey.

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[a] Wells, Walter, The Water Power of Maine, 1869, pp. 94–97.

Summary of storage in Kennebec basin.

CONNECTED WITH MOOSE RIVER.

	Approximate area.	Present storage.	Additional available storage.
	Sq. miles.	*Feet.*	*Feet.*
Brassua Lake	5.55	None	10-15.
Miseree Pond	1.5	2 or more	Can be raised.
Parlin Pond	2.75	5, formerly	3.
Long Pond	5	8	
Wood Pond	3.3	None	10.
Little Big Wood Pond	1.35	7	10.
Attean Pond	4.5	None	10 by dam at outlet of Wood Pond
Holeb Pond	2	do	Can be raised by a dam at Holeb Falls.
Thorndike Ponds (2)	1	6 (one pond)	The other can be raised 6 feet.
	26.95		

CONNECTED WITH DEAD RIVER.

Spencer Ponds	2.6	12	4 or 5.
Pond in T. 5, R. 7	0.5		6.
Great Pond [a]	4		Considerable.
King and Bartlett Pond	1		
Spring Lake	1.1		10
Flagstaff Lake	1.4	12	More.
Carrying Place Pond (the largest)	1.3	10	10 or more.
Jim Pond, T. 1, R. 5	1	8	2.
Tim Pond, T. 2, R. 4	1.25	9	
Chain of Ponds (3)	5	8	2; one dam flows all.
	19.15		

CONNECTED WITH CARRABASSETT RIVER.

Fahi Pond	0.6	4	4.
Sandy Pond	.4		
Embden Pond	2.4	4	12.
Hancock Pond	1	4	Several.
Spruce Pond	.35		
Rowe Pond	.7		8.
Gilman Pond	.5	Dam	
Judkins Pond	.75		
Butler Pond	.4		
Porters Pond	1	Dam	4.
Tufts Pond	.5		Several.
Dutton Pond	.2	8	Do.
Jerusalem Pond	.3	Dam	Do.
Carrying Place Pond (middle)	.3	do	Do.
	9.1		

CONNECTED WITH SANDY RIVER.

Bog Pond	1		
Clear Water Pond	1.75	8	3.
Norcross Pond	.35		
Chesterville Ponds (6)	2	Dam	4 or 5 can be had on four ponds.
Wilton Pond [b]	1.25	7	Can raise 2 feet and lower outlet 3 feet.
North Pond	1	Dam	Can raise dam and lower outlet.
Taylor Pond	.2		
Sandy River Ponds (4)	1	2	Several.
Lufikin Pond	1.25	0	5.
Sylvester Pond	.3	Dam	
	10.1		

[a] It is uncertain whether this pond exists as given by Wells.
[b] Called Wilson Pond by Wells.

Summary of storage in Kennebec basin—Continued.

CONNECTED WITH WESSERUNSETT STREAM

	Approximate area.	Present storage.	Additional available storage.
	Sq. miles.	*Feet.*	*Feet.*
Hayden Lake	3	7	3.
Wentworth Pond	1	None	10.
Bakers Pond		do	Can be made a good reservoir.
Wyman Pond	.75	None	9.
Weeks Pond	.6	6	
	5.35		

CONNECTED WITH SEBASTICOOK RIVER.

	Approximate area.	Present storage.	Additional available storage.
China Lake	6.1	6	
Pattee Pond	.85		
Lovejoy Pond	.7		
Sandy Pond	.95	6	
Twenty-five Mile Pond	4.25	2	2, by lowering outlet
Carlton Bog	1.75		4, on 3.50 square miles.
Plymouth Pond, with flowage	3	10	
Skinner Pond	.7		
Stetson Pond	2.5		Several.
Sebasticook Lake	7.5	4	4.
Corinna Pond	.6		
Dexter Ponds	3	8	
Palmyra Ponds (2)	.6		
Stuarts Pond	.8		
Indian Pond, with flowage	2.5	Dam	
Little Indian Pond	.35		
Weymouth Pond	.4		
Rogers Pond	.9		Can have a high dam.
Mill Pond	1.1		
Moose Pond	9.5	4	10 or more.
Stafford Pond	.35		
Starbird Pond	.35		
Barker Pond	.35		
	48.2		

CONNECTED WITH MESSALONSKEE STREAM.

	Approximate area.	Present storage.	Additional available storage.
Messalonskee Lake	5.4	4–5	4, with large flowage.
Long Pond	4.2	1–2	
Great Pond	12.7	Dam	
Ellis Pond	.9		
McGrath Pond	.7		
Little Pond	.35		
East Pond	2.6	8	
North and Little ponds	3.6		
	30.45		

CONNECTED WITH COBBOSSEECONTEE STREAM.

	Approximate area.	Present storage.	Additional available storage.
Pleasant Pond	1.1	4	3 by higher dams and 3 by cutting down the 'Rips" and "Hazards" ledge.
Purgatory Pond (first)	.7	3	The three Purgatory ponds can be raised 8 feet and drawn down 4 feet.
Purgatory Pond (second)	.5	Dam	
Purgatory Pond (third)	.2		
Cochnewagon Pond	1	7	0.
Wilsons Pond	.9	4	(?) 0.
Cobbosseecontee Pond	8.4	4	Can draw down and add 6 feet.
Narrows Pond	.8		
Lake Annabessacook	2.2	3	3.
Lake Maranacook	2.5		
Carlton Pond	.5		
Greeley Pond	1.1		
Sanborn Pond	.3	0	Can be flowed.
Desert Pond	.3		
Jamies Pond [a]	.3		
	20.9		

[a] Called Jimmy's Pond by Wells.

Summary of storage in Kennebec basin—Continued.

CONNECTED WITH KENNEBEC RIVER ABOVE AUGUSTA.

	Approximate area.	Present storage.	Additional available storage.
	Sq. miles.	*Feet.*	*Feet.*
Weber Pond	1.9	6	
Threemile Pond	1.6	8	
Sibley and Morrill ponds	2		10, on Morrill.
Long Pond	.95		
Austin Ponds (5)	3.2		All can have dams.
Robinson Pond	.75		
Pleasant Pond	1.6	4	8.
Mores Bog Stream Pond (Carritunk)			
Otter Ponds (2)	.5		
Chase Ponds (3)	1		
Mosquito Pond	1		12.
Moxie Pond	2.6	9	5 or more.
Lower Baker Pond	1		
Black Brook Pond	.5	8	2.
Knights Pond	.2	7	2.
Pierce Pond	2.3	10	Good reservoir.
Carrying Place Pond (Lower)	1	0	High dam.
Cold Stream Pond	1.25		12.
Chase Stream Pond	.6		
Indian Pond	1.5	12	
Moosehead Lake	115.	7.5	2.
Lower Roach Pond	5	8	4.
Middle Roach Pond	1.5	6	2.
Upper Roach Pond	1.5	Poor dam	
Tomhegan Pond	.75	No dam	6.
Spencer Pond	1.5	4	
West Outlet Ponds (3)	1.25	Dam feasible.	
	152.45		

CONNECTED WITH KENNEBEC RIVER BELOW AUGUSTA.

Nequasset Pond	0.6		
Togus Pond	1	Dam	10.
Small ponds in Augusta	1.5		
Gardiner Pond[a]	.9		
	4		

[a] Called Great Swamp in Dresden by Wells.

Summary of areas of principal lakes and ponds in Kennebec basin.

	Square miles.
Moose River	26.95
Dead River	19.15
Carrabassett River	9.10
Sandy River	10.10
Wesserunsett Stream	5.35
Sebasticook River	48.20
Messalonskee Stream	30.45
Cobbosseecontee Stream	20.90
Kennebec River above Augusta	152.45
Kennebec River below Augusta	4.00
Total (152 lakes and ponds)	326.65
Total as given by Wells	357.15

Wells gives a total lake and pond surface area in the Kennebec basin of about 450 square miles. It is probable, in view of such partial corrections as have been made in the foregoing tables, that the total area of lakes and ponds is not over 420 square miles, or 1 square mile to each 14.2 square miles of total drainage area.

EFFECT OF PRESENT STORAGE ON FLOW.

The measurements of flow in the Kennebec basin by the United States Geological Survey have been carried on since about 1901; records of flow at Waterville since 1892 and records of height of water surface of Moosehead Lake since May, 1895, have been kept by the Hollingsworth & Whitney Company, so that some idea can be derived as to the amount of storage obtained at this lake and its effect on the flow of Kennebec River.

The following table gives the monthly mean run-off as observed at Waterville, North Anson, and The Forks and the estimated run-off without storage in Moosehead Lake. The corrections were obtained for any given monthly flow by computing the quantity of water corresponding to the change in lake level during the month, reducing this to an equivalent mean flow in second-feet, and dividing this result by the drainage area at the point considered. This correction was added to the observed run-off if the lake level rose during the month and subtracted if the lake level fell. The results thus obtained are not strictly the run-off that would have resulted had there been no storing of water in Moosehead Lake, as during the time of storage some water evaporates that would appear as run-off if no water were held back. In this form, however, the results obtained are suitable for computations regarding storage, as evaporation is thus taken into account on the present water-surface area, and as the increase in this area due to raising the level for additional storage is not generally of large percentage value we may consider that for all practical purposes allowance has been made for evaporation from the water surface of the present storage reservoirs (mainly Moosehead Lake; see table on p. 133). From any new reservoirs, such as Brassua Lake and Attean and Wood ponds, there would be an increased amount of evaporation due to the water being held for a longer time than is done at present; but, on the other hand, the ground storage of water in the vicinity of all these lakes and ponds would be greatly increased, and it is probable that these two factors would largely offset each other. In the following estimates of additional storage capacity it will be considered that evaporation from water surface of the storage reservoirs has been taken into account in the figures used for run-off:

Effect of storage of water in Moosehead Lake on flow at Waterville, North Anson, and The Forks.

Month.	Flow in second-feet per square mile of drainage area.					
	Waterville (drainage area 4,270 square miles).		North Anson (drainage area 2,790 square miles).		The Forks (drainage area 1,570 square miles).	
	Observed flow.	Estimated flow without storage.	Observed flow.	Estimated flow without storage.	Observed flow.	Estimated flow without storage.
1895.						
January	0.48	....	....	....	....	....
February	.42	....	....	....	....	....
March	.47	....	....	....	....	....
April	5.60	....	....	....	....	....
May	2.24	2.62	....	....	....	....
June	1.50	.80	....	....	....	....
July	.82	.59	....	....	....	....
August	.63	.38	....	....	....	....
September	.42	—.04	....	....	....	....
October	.29	.41	....	....	....	....
November	1.31	1.84	....	....	....	....
December	1.41	1.94	....	....	....	....
1896.						
January	1.01	1.23	....	....	....	....
February	.66	.53	....	....	....	....
March	3.07	3.24	....	....	....	....
April	6.42	6.99	....	....	....	....
May	3.99	3.68	....	....	....	....
June	1.29	.90	....	....	....	....
July	1.25	.88	....	....	....	....
August	.74	.32	....	....	....	....
September	.80	.73	....	....	....	....
October	.86	1.01	....	....	....	....
November	2.12	2.79	....	....	....	....
December	.64	.63	....	....	....	....
1897.						
January	.84	.82	....	....	....	....
February	.87	.70	....	....	....	....
March	.93	.89	....	....	....	....
April	5.94	6.79	....	....	....	....
May	6.30	6.53	....	....	....	....
June	3.04	2.65	....	....	....	....
July	3.07	2.94	....	....	....	....
August	1.71	1.35	....	....	....	....
September	1.07	.67	....	....	....	....
October	.62	.56	....	....	....	....
November	1.33	1.47	....	....	....	....
December	1.25	1.62	....	....	....	....
1898.						
January	.75	.74	....	....	....	....
February	.80	.69	....	....	....	....
March	2.64	2.35	....	....	....	....
April	6.98	8.02	....	....	....	....
May	5.88	5.92	....	....	....	....
June	2.34	1.83	....	....	....	....
July	.92	.36	....	....	....	....
August	.73	.36	....	....	....	....
September	.61	.54	....	....	....	....
October	.95	1.11	....	....	....	....
November	1.21	1.54	....	....	....	....
December	.61	.75	....	....	....	....
1899.						
January	.55	.48	....	....	....	....
February	.55	.37	....	....	....	....
March	.75	.71	....	....	....	....
April	5.62	6.41	....	....	....	....
May	4.98	5.22	....	....	....	....
June	2.06	1.54	....	....	....	....
July	1.19	1.08	....	....	....	....
August	.77	.47	....	....	....	....
September	.43	.06	....	....	....	....
October	.30	.15	....	....	....	....
November	.53	.54	....	....	....	....
December	.64	.74	....	....	....	....

Effect of storage of water in Moosehead Lake on flow at Waterville, North Anson, and The Forks—Continued.

Month.	Flow in second-feet per square mile of drainage area.					
	Waterville (drainage area 4,270 square miles).		North Anson (drainage area 2,790 square miles).		The Forks (drainage area 1,570 square miles).	
	Observed flow.	Estimated flow without storage.	Observed flow.	Estimated flow without storage.	Observed flow.	Estimated flow without storage.
1900.						
January	0.56	0.57				
February	2.12	2.50				
March	2.14	2.28				
April	6.66	7.50				
May	6.62	6.87				
June	2.35	1.96				
July	1.35	1.20				
August	.98	.53				
September	.66	.26				
October	.72	.65				
November	1.49	1.88				
December	.96	.96				
1901.						
January	.74	.59				
February	.58	.42				
March	1.13	.90				
April	9.63	11.24				
May	3.55	3.42				
June	1.93	1.52				
July	1.20	.75				
August	.98	1.02				
September	.66	.34				
October	.68	.40			1.01	0.22
November	.56	.41			.89	.47
December	2.79	3.38				
1902.						
January	.90	1.07				
February	.89	.74				
March	6.73	7.01			2.08	2.83
April	5.19	6.09	5.29	6.67	6.37	8.82
May	3.95	3.98	4.99	5.03	6.05	6.13
June	3.57	3.47	4.58	4.42	6.11	5.83
July	1.83	1.39	2.66	1.91	3.86	2.52
August	1.18	.93	1.50	1.12	1.87	1.18
September	.99	.96	1.25	1.21	1.04	.96
October	1.23	1.23	1.31	1.31	.91	.91
November	1.06	1.31	1.30	1.68		
December	1.02	.94				
1903.						
January	.94	.94				
February	.93	.64				
March	4.54	5.28			2.08	4.08
April	3.85	3.92	4.22	4.33	5.32	5.52
May	1.70	1.63	2.62	2.51	2.26	2.06
June	1.57	1.32	2.06	1.67	2.72	2.05
July	1.22	.82	1.45	.85	2.93	1.85
August	.91	.69	1.31	.97	1.78	1.18
September	.59	.16	1.00	.35	1.21	.05
October	.45	.19	.70	.32	.71	.00
November	.34	.22	.52	.32	.44	.09
December	.32		.36			
1904.						
January	.23		.25			
February	.22		.24			
March	.89		.33			
April	3.50		2.67			
May	4.85	6.36	5.10	7.42	3.22	7.34
June	1.94	1.62	2.76	2.27	4.15	3.28
July	1.25	.10	1.88	1.50	3.60	2.92
August	1.10	.71	1.46	.87	1.89	.83
September	1.00	1.12	1.29	1.46	1.35	1.66
October	1.10	1.36	1.46	1.86	.10	.72
November	.79	.74	1.09	1.02	.85	.73
December	.64	.42	.99	.64		

Effect of storage of water in Moosehead Lake on flow at Waterville, North Anson, and The Forks—Continued.

Month.	Flow in second-feet per square mile of drainage area.					
	Waterville (drainage area 4,270 square miles).		North Anson (drainage area 2,790 square miles).		The Forks (drainage area 1,570 square miles).	
	Observed flow.	Estimated flow without storage.	Observed flow.	Estimated flow without storage.	Observed flow.	Estimated flow without storage.
1905.						
January	0.72	0.14	0.95	0.07	....	....
February	.62	.34	.74	.32	....	....
March	1.23	1.37	1.47	1.68	....	....
April	3.16	3.99	3.74	5.01	1.06	3.32
May	2.46	3.07	3.12	4.06	2.76	4.43
June	1.57	1.35	2.52	2.19	3.44	2.85
July	1.09	.71	1.97	1.39	2.59	1.57
August	.75	.32	1.04	.38	1.32	.16
September	.70	.47	.71	.36	.80	.18
October	.41	.21	.43	.12	.55	—.01
November	.54	.40	.48	.27	.54	.15
December	.48	.35	.91	.70	....	....
1906.						
January	.75	.75	.60	.60	....	....
February	.53	.62	.44	.58	....	....
March	.54	.54	.44	.44	....	....
April	4.02	4.62	2.55	3.44	....	....
May	5.22	6.50	4.75	6.71	4.75	8.24
June	2.99	2.84	2.67	2.45	3.65	3.25

The effect of present storage in Moosehead Lake is clearly shown by the above table, the maximum spring flow being considerably less than would have been the case if no water had been held back. During the summer and fall months the flow has been very materially helped out by the stored water. From December, 1903, to February, 1904, inclusive, and again during January, 1906, practically all the lake storage was exhausted and the flow through the lake was probably a natural one.

WATER AVAILABLE IN KENNEBEC HEADWATERS.

GENERAL DISCUSSION.

The figures of run-off in the table last given furnish a fairly satisfactory basis for an estimate of the quantity of water available in the Kennebec headwaters. For the ordinary year there is enough run-off from that portion of the Kennebec basin which is tributary to Moosehead Lake to fill the lake and to provide a good flow during the late summer and fall, but there will occasionally be a year—perhaps two or more years in succession—when this will not be true. It is therefore necessary to consider the run-off over a series of years in order to see what flow may occur during the low-water season and to ascertain what quantities of water must be stored to insure any given flow at all times.

The following estimates and conclusions are based primarily on the flow at Waterville, as these data comprise the only records available that extend over a considerable term of years. The records of flow at the other gaging stations, however, furnish a means of comparing the Waterville flow with that in other parts of the basin, and enable reasonably good estimates of the flow at Moosehead Lake Outlet to be made.

A comparison of the flow from different parts of the Kennebec basin will first be made for the months of July to October, inclusive, as records are more generally available for these summer months. The following table gives the run-off from various portions of the basin and the ratio to it of the flow at Waterville:

Run-off in second-feet per square mile at various points in Kennebec basin compared with run-off at Waterville.[a]

JULY TO OCTOBER, INCLUSIVE, 1903-1905.

River and station.	Drainage area.	Average run-off per square mile.	Ratio of run-off at Waterville to that at given station.
	Sq. miles.	*Second-feet.*	
Moose at Rockwood	680	0.77	0.84
Roach at Roach River	85		
Kennebec at The Forks	1,570	1.01	.64
Kennebec at The Forks	1,570	.93	.70
Dead at The Forks	870		
Kennebec at North Anson	2,790	.87	.75
Carrabassett at North Anson	340	.67	.97
Sandy at Madison	650		
Kennebec at Waterville	4,270	.65	1.00

MAY TO OCTOBER, INCLUSIVE, 1902-1905.

River and station.	Drainage area.	Average run-off per square mile.	Ratio of run-off at Waterville to that at given station.
Kennebec at The Forks	1,570	2.15	0.68
Kennebec at North Anson	2,790	1.90	.77
Kennebec at Waterville	4,270	1.46	1.00

YEARS 1904-5.

River and station.	Drainage area.	Year.	Average run-off per square mile.	Ratio of run-off at Waterville to that at given station.
	Sq. miles.		*Second-feet.*	
Kennebec at North Anson	2,790	1904	1.71	0.89
		1905	1.38	.77
		Mean	1.54	.83
Kennebec at Waterville	4,270	1904	1.52	1.00
		1905	1.06	1.00
		Mean	1.29	1.00

[a] In this table the run-off at The Forks, North Anson, and Waterville on Kennebec River is corrected for storage in Moosehead Lake, as previously explained.

The above table clearly indicates that the run-off per square mile of drainage area is considerably greater in the upper part of the basin and that on the main river the increase is fairly uniform toward the north.

The flow on Kennebec River at The Forks may be taken as fairly representative of that at Moosehead Lake Outlet, as the outlet is only about 23 miles above The Forks and the respective drainage areas are 1,240 and 1,570 square miles.

The average flow at Waterville for the four summer months, 1903–1905, is 0.64 of that at The Forks, and for the six months May to October, inclusive, 1902–1905, it is 0.68 of that at The Forks. Probably for the whole year (see ratios for North Anson) this ratio would be somewhat higher, and it will be assumed that the unit run-off at Waterville is 0.75 of that at Moosehead Lake outlet.

The method used for computing the amount of water available on the Kennebec headwaters is that used by W. Rippl[a] and adopted by Desmond FitzGerald in a report to the city of Boston on the "storage capacity of the Sudbury River and Lake Cochituate watersheds," modified for different conditions by Walter H. Sawyer, C. E.[b] Rippl's method is adapted for the storage of water for municipal purposes, where water is taken from the reservoir and led to the point of consumption with no further addition to its quantity. On the Kennebec, however, between Moosehead Lake and the points along the river where power is used, there is a large tributary drainage area that must be taken into account. Another requirement must also be kept in mind on this river, viz, the use of the water to drive logs, so that it must not fall below a certain amount during the driving months anywhere on the river below Moosehead Lake outlet. The amounts of water used for this purpose during 1904–1906 are given on page 164.

The following table shows the water available for storage in Moosehead Lake from 1902 to 1906. The computations are based on a minimum flow of 3,500 second-feet at Waterville and a flow of 3,000 second-feet from Moosehead Lake during the log-driving season (May, June, and July).

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[a] Proc. Inst. Civil Eng., vol. 71, 1882–83, pp. 270–278.

[b] Storage of Water on Androscoggin River, 1905, unpublished.

Water available for storage in Moosehead Lake.

1	2	3	4	5	6	7	8	9	10
Month.	Run-off in second-feet per square mile at Waterville.	Run-off in second-feet per square mile at Moosehead Lake.	Discharge at Waterville, in second-feet.	Discharge into Moosehead Lake, in second-feet.	Discharge between Moosehead Lake Outlet and Waterville, in second-feet.	Necessary discharge from Moosehead Lake, in second-feet.	Surplus (+) or deficit (−) at Moosehead Lake.		Water available for storage, billion cubic feet.
							Second-feet.	Billion cubic feet.	
Jan. 1, 1893, to Dec. 31, 1901									314.50
1902.									
January	1.07	1.42	4,570	1,760	2,810	690	+ 1,070	+ 2.77	317.27
February	.74	.99	3,160	1,230	1,930	1,570	− 340	− .78	316.49
March	7.01	9.33	29,800	11,570	18,230	0	+11,570	+30	346.49
April	6.09	8.10	26,000	10,050	15,950	0	+10,050	+26.05	372.54
May	3.98	5.30	17,000	6,580	10,420	3,000	+ 3,580	+ 9.28	381.82
June	3.47	4.62	14,820	5,740	9,080	3,000	+ 2,740	+ 7.10	388.92
July	1.34	1.78	5,720	2,210	3,510	3,000	− 790	− 2.04	386.88
August	.93	1.24	3,970	1,540	2,430	1,070	+ 470	+ 1.22	388.10
September	.96	1.28	4,100	1,590	2,510	990	+ 600	+ 1.55	389.65
October	1.23	1.64	5,250	2,040	3,210	290	+ 1,750	+ 4.53	394.18
November	1.31	1.74	5,590	2,160	3.430	70	+ 2,090	+ 5.42	399.60
December	.94	1.25	4,010	1,550	2,460	1,040	+ 510	+ 1.32	400.92
1903.									
January	.94	1.25	4,010	1,550	2,460	1,040	+ 510	+ 1.32	402.24
February	.64	.85	2,740	1,050	1,690	1,810	− 760	− 1.97	400.27
March	5.28	7.03	22,550	8,720	13,830	0	+ 8,720	+22.60	422.87
April	3.92	5.21	16,730	6,460	10,270	0	+ 6,460	+16.72	439.59
May	1.63	2.17	6,960	2,690	4,270	3,000	− 310	− .80	438.79
June	1.32	1.76	5,630	2,180	3,450	3,000	− 820	− 2.12	436.67
July	.83	1.10	3,540	1,360	2,180	3,000	− 1,640	− 4.25	432.42
August	.69	.92	2,950	1,140	1,810	1,690	− 550	− 1.42	431.00
September	.16	.21	680	260	420	3,080	− 2,820	− 7.31	423.69
October	.19	.25	810	310	500	3,000	− 2,600	− 6.97	416.72
November	.22	.29	940	360	580	2,920	− 2,560	− 6.63	410.09
December [a]	.32	.43	1,370	530	840	2,660	− 2,130	− 5.52	404.57
1904.									
January	[a] .23	.31	980	390	590	2,910	− 2,520	− 6.53	398.04
February	[a] .22	.29	940	360	580	2,920	− 2,560	− 6.63	391.41
March	[a] .89	1.18	3,800	1,470	2,330	1,170	+ 300	+ .78	392.19
April	[a] 3.50	4.66	14,950	5,790	9,160	0	+ 5,790	+15.00	407.19
May	6.36	8.46	27,150	10,500	16,650	3,000	+ 7,500	+19.42	426.61
June	1.62	2.16	6,920	2,680	4,240	3,000	− 320	− .83	425.78
July	1.00	1.33	4,270	1,650	2,620	3,000	− 1,350	− 3.50	422.28
August	.71	.94	3,030	1,160	1,870	1,630	− 470	− 1.22	421.06
September	1.12	1.49	4,780	1,850	2,930	570	+ 1,280	+ 3.32	424.38
October	1.36	1.81	5,800	2,240	3,560	0	+ 2,240	+ 5.80	430.18
November	.75	1.00	3,200	1,240	1,960	1,540	− 300	− .78	429.40
December	.42	.56	1,790	690	1,100	2,400	− 1,710	− 4.43	424.97
1905.									
January	.14	.19	600	240	360	3,140	− 2,900	− 7.51	417.46
February	.34	.45	1,450	550	900	2,600	− 2,050	− 5.31	412.15
March	1.37	1.82	5,850	2,260	3,590	0	+ 2,260	+ 5.85	418.00
April	3.99	5.31	17,050	6,590	10,460	0	+ 6,590	+17.18	435.18
May	3.07	4.08	13,120	5,070	8,050	3,000	+ 2,070	+ 5.36	440.54
June	1.35	1.79	5,760	2,220	3,540	3,000	− 780	− 2.02	438.52
July	.71	.94	3,030	1,160	1,770	3,000	− 1,840	− 4.77	433.75
August	.32	.43	1,370	530	840	2,660	− 2,130	− 5.52	428.23
September	.47	.62	2,010	770	1,240	2,260	− 1,490	− 3.86	424.37
October	.21	.28	900	350	550	2,950	− 2,600	− 6.74	417.63
November	.40	.53	1,710	660	1,050	2,450	− 1,790	− 4.63	413.00
December	.35	.47	1,490	580	910	2,590	− 2,010	− 5.20	407.80
1906.									
January	.75	1.00	3,200	1,240	1,960	1,540	− 300	− .78	407.02
February	.62	.82	2,650	1,020	1,630	1,870	− 850	− 2.20	404.82
March	.54	.72	2,310	890	1,420	2,080	− 1,190	− 3.08	401.74
April	4.62	6.15	19,720	7,620	12,100	0	+ 7,620	+19.72	421.46
May	6.50	8.64	27,800	10,700	17,100	3,000	+ 7,700	+19.94	441.40
June	2.84	3.78	12,130	4,690	7,440	3,000	+ 1,690	+ 4.38	445.78

[a] No records at Moosehead. Actual run-off figures used.

Column 2 contains the mean monthly run-off at Waterville in second-feet per square mile of drainage area.

Column 3 shows the run-off at Moosehead Lake in second-feet per square mile of drainage area. It is obtained by multiplying column 2 by 1.33, as the run-off per square mile on the area tributary to Moosehead Lake is 1.33 times that on the entire basin above Waterville.

Column 4 gives the discharge in second-feet at Waterville. It is obtained by multiplying the run-off in second-feet per square mile at Waterville (column 2) by 4,270, the area of the drainage basin at Waterville.

Column 5 gives the discharge in second-feet into Moosehead Lake. It is obtained by multiplying the run-off in second-feet per square mile at Moosehead Lake (column 3) by 1,240, the area of the drainage basin of Moosehead Lake.

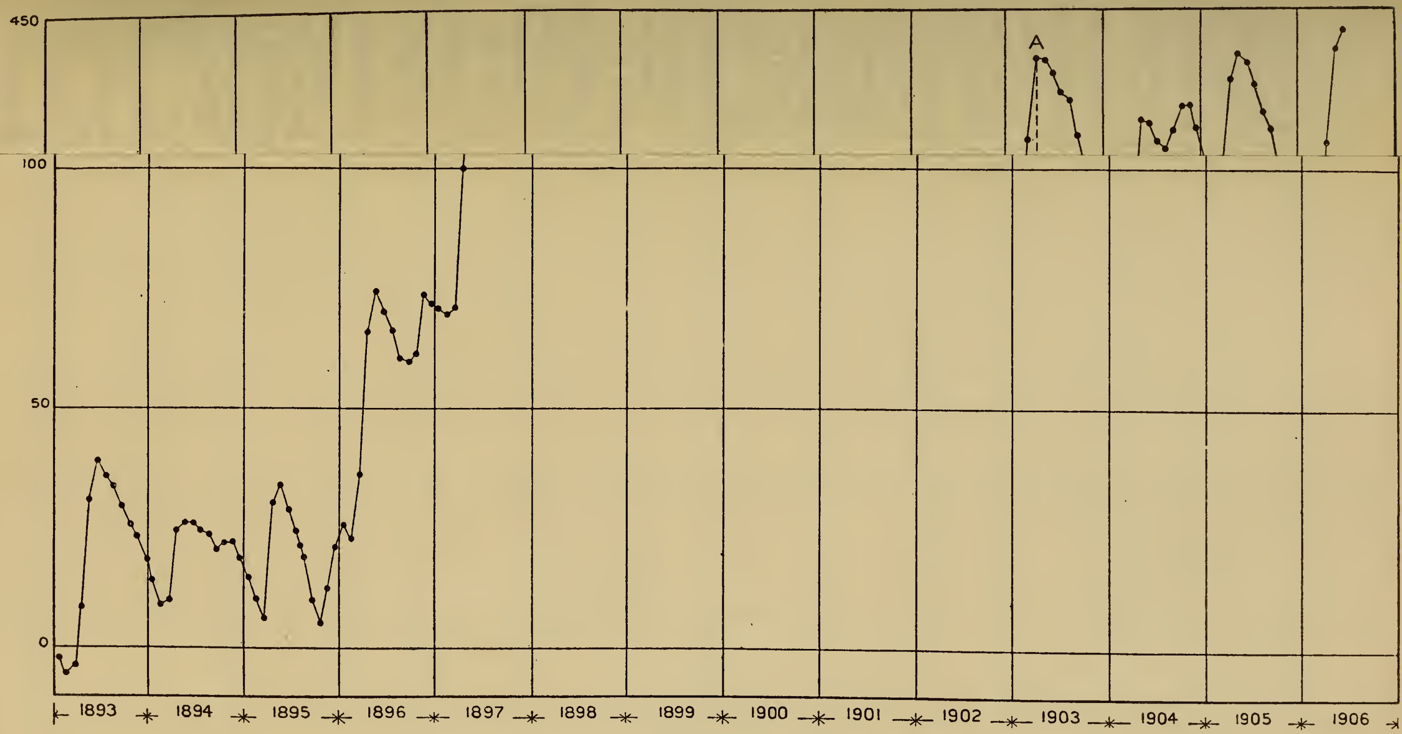
Column 6 gives the discharge in second-feet between Moosehead Lake Outlet and Waterville. It is obtained by subtracting the discharge into Moosehead Lake (column 5) from the discharge at Waterville (column 6.)

Column 7 shows the discharge necessary at Moosehead Lake Outlet to give a flow of 3,500 second-feet at Waterville throughout the year and a flow of 3,000 second-feet at Moosehead Lake Outlet during the log-driving season (May, June, and July). When the discharge between the outlet and Waterville is greater than 3,500 second-feet, it will not be necessary to release any water from the lake; when the flow between the lake and Waterville is less than 3,500 second-feet, the amount necessary is determined by subtracting the flow between Moosehead Lake Outlet and Waterville (column 6) from 3,500; during the log-driving season (May, June, and July) a discharge of 3,000 second-feet is necessary at the outlet.

Column 8 shows the surplus (+) or deficit (—) at Moosehead Lake, a surplus indicating water available for storage and a deficit indicating a withdrawal from Moosehead Lake. The figures are obtained by subtracting the necessary discharge from Moosehead Lake (column 7) from the discharge into Moosehead Lake (column 5).

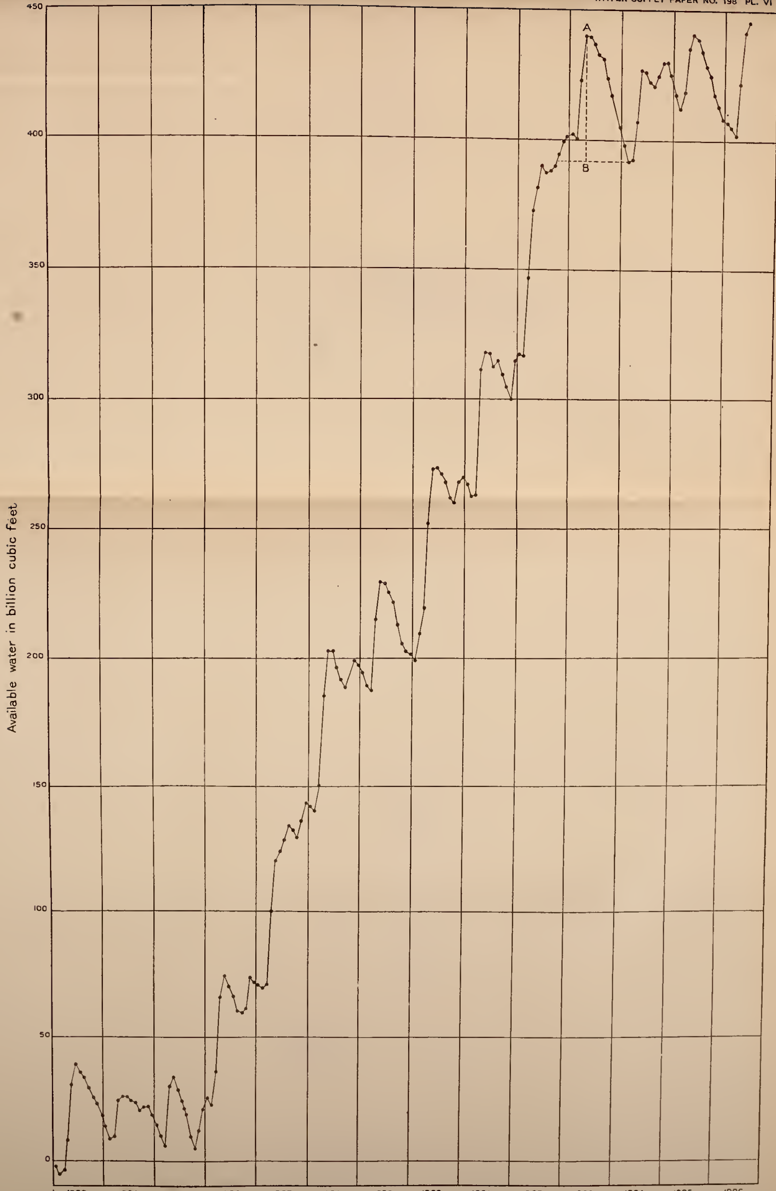
Column 9 is the equivalent of column 8 expressed in billions of cubic feet.

Column 10 shows the total surplus water, in billions of cubic feet, available for storage during any given month under the given assumptions of minimum flow, etc. The initial value (314.50) represents the total quantity available January 1, 1902, if all the surplus water had been stored since January, 1893. The other values in column 10 are obtained by adding or subtracting respectively the surplus or deficit shown in column 9. The values in this column are used in plotting the "mass curve" (Pl. VI).



STORAGE-MASS CURVE FOR MOOSEHEAD LAKE.

Based on a minimum flow of 3,500 second-feet at Waterville, and a flow of 3,000 second-feet from Moosehead Lake during log-driving period (May, June, and July).



STORAGE-MASS CURVE FOR MOOSEHEAD LAKE.

Based on a minimum flow of 3,500 second-feet at Waterville, and a flow of 3,000 second-feet from Moosehead Lake during log-driving period (May, June, and July).

DISCUSSION OF MASS CURVES.

Pl. VI is a "mass diagram" for the total period embraced by the Waterville records (1893–1906). It is made up from a table of which the table on page 151 is a portion, by plotting the values given in column 10 as ordinates and the time in months as abscissas. The features of this diagram of especial importance are as follows:

(1) For the interval of time between any two dates represented on the axis of abscissas, the surplus or deficiency is obtained by subtracting the ordinate corresponding to the earlier date from the ordinate corresponding to the later date; if this difference is positive it represents a surplus; if it is negative it represents a deficiency. An ascending part of the curve, therefore, shows a period during which the quantity of available water is increasing, and a descending part of the curve indicates a period during which the quantity of available water is decreasing.

(2) The crests and hollows of the curve indicate those instants of time when supply and demand are equal.

(3) If a horizontal line is drawn from any of the low points of the curve back to a rising line the maximum ordinate scaled from the horizontal line to the curve will show the amount in billions of cubic feet that would have to be stored to provide the assumed flow during the period of drought covered by the horizontal line.

(4) The period during which this greatest ordinate occurs is therefore the critical one, and all the surplus of supply over demand during parts of this period must be stored to meet the deficiency during the remainder of it.

Pl. VI shows that the period which includes the maximum ordinate extends from about October, 1902, to February, 1904, and that the maximum ordinate falls in April, 1903. This maximum ordinate (A–B, Pl. VI) corresponds to 48.2 billion cubic feet, which is the amount of storage required to provide at all times from April, 1903, to February, 1904, a minimum flow of 3,500 second-feet at Waterville, and during May, June, and July a minimum flow of 3,000 second-feet at Moosehead Lake Outlet for the purpose of log driving.

The effect of modifying the assumed conditions of minimum flow at Waterville is shown by fig. 6. These mass curves start for convenience with April, 1903, and represent minimum flows of 3,000, 3,500, and 4,000 second-feet at Waterville and a flow of 3,000 second-feet from Moosehead Lake during the log-driving season (May, June, and July). With the exception of the curve for 3,500 second-feet minimum flow, which is the same as Pl. VI, the quantity of available water as shown by these curves is not correct as a total for the entire period beginning in 1893, because the computations for the different minimum flows are not carried back to the beginning of the period. However, the amount available between any two dates is correctly shown and the maximum ordinate is found as before. Fig. 6 gives the following data:

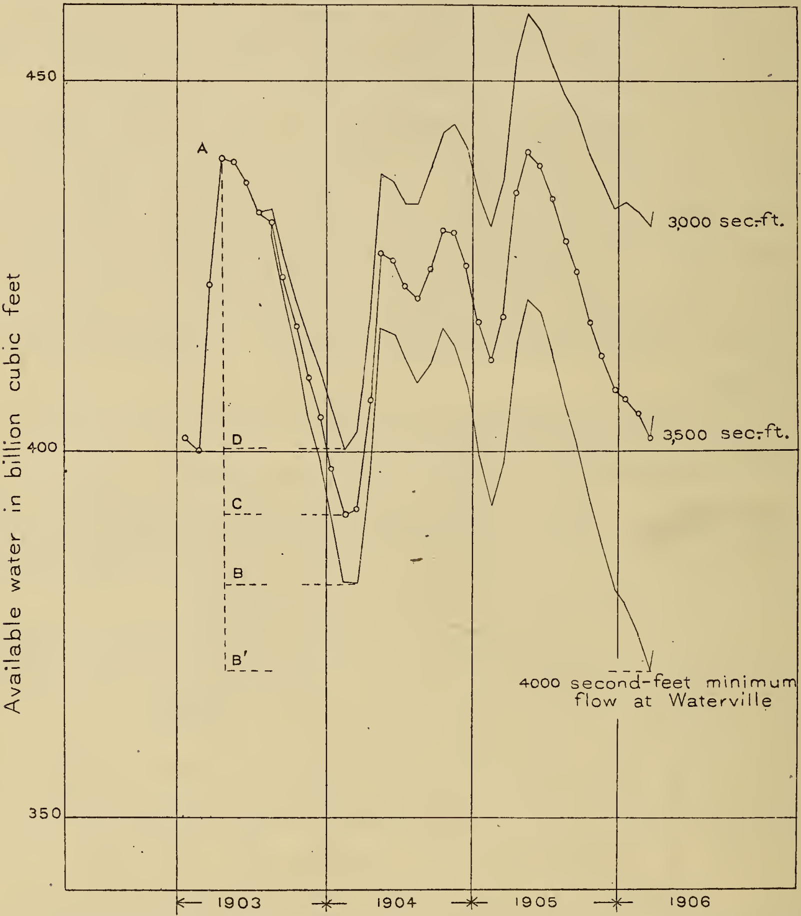


FIG. 6.—Storage mass curves for Moosehead Lake, based on various minimum flows at Waterville and a flow of 3,000 second-feet from Moosehead Lake during log-driving period (May, June, and July).

Storage necessary for flow of 3,000 second-feet from Moosehead Lake during log-driving season and for various minimum flows at Waterville.

Assumed minimum flow at Waterville.	Maximum ordinate in fig. 6.	Storage required.
Second-feet.		*Billion cubic feet.*
3,000	A-D	39.1
3,500	A-C	48.2
4,000	A-B′	69.0

An inspection of fig. 6 indicates that with an assumed minimum flow of more than about 3,700 second-feet the maximum ordinate is defined by an abscissa drawn through the mass curve at March, 1906, instead of March, 1904 (that is, A–B′ instead of A–B), so that above

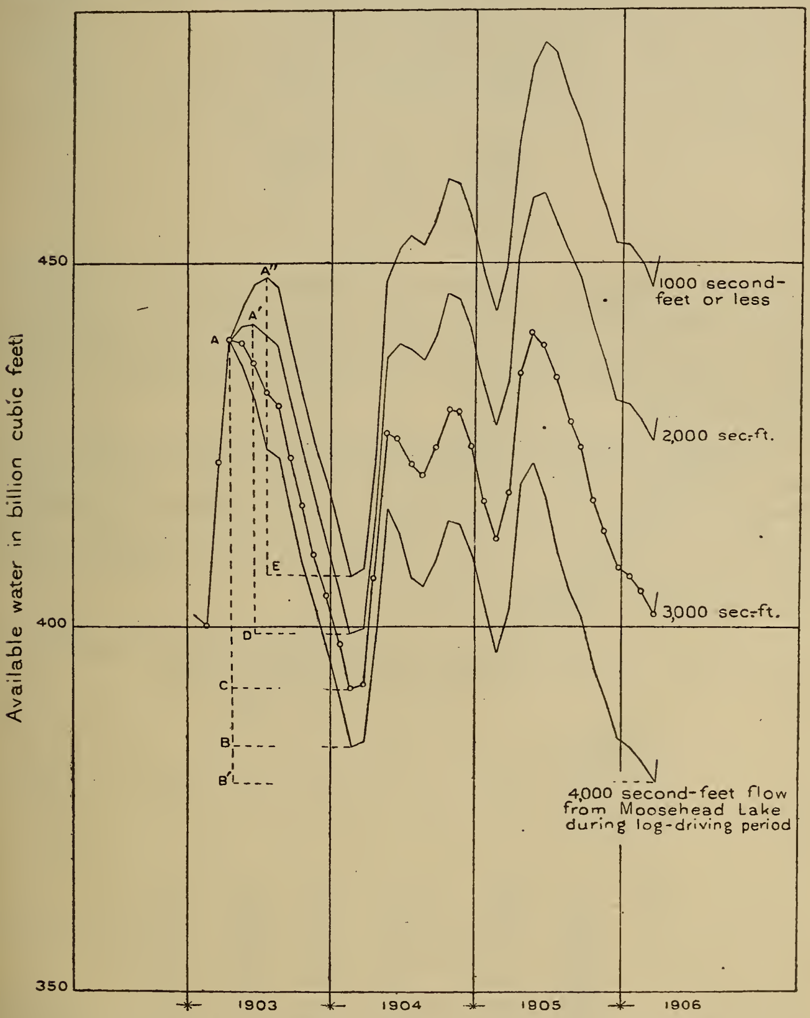


FIG. 7.—Storage mass curves for Moosehead Lake, based on a minimum flow of 3,500 second-feet at Waterville and various flows from Moosehead Lake during log-driving period (May, June, and July).

this minimum flow the required storage will increase much more rapidly.

The effect of modifying the amount of water used for log driving is shown by fig. 7. These mass curves start with April, 1903, as those in fig. 6, but they represent a minimum flow at Waterville of 3,500 second-feet, and flows of 1,000, 2,000, 3,000, and 4,000 second-feet from Moosehead Lake during the log-driving season (May, June, and July). From this diagram the following data are obtained:

Storage necessary for 3,500 second-feet minimum flow at Waterville and for various flows during log-driving season.

Assumed quantity for log driving.	Maximum ordinate in fig. 7.	Storage required.
Second-feet.		*Billion cubic feet.*
1,000	A″-E	41.1
2,000	A′-D	42.7
3,000	A -C	48.2
4,000	A -B′	61.0

If 3,750 second-feet or more are considered for log driving the necessary storage period is much increased. If 4,000 instead of 3,000 second-feet are used, the storage period is about three years instead of less than one year, and the amount of storage is represented by A–B′ instead of A–B.

The following table is based on the results previously given, as well as on additional mass curves and tables not shown. In all cases the assumptions regarding minimum flow and flow during the log-driving period are such that the shorter period of required storage, ending with February, 1904 (see Pl. VI, figs. 6, and 7), furnishes the maximum ordinate or amount required.

Storage necessary, in billion cubic feet, for various minimum flows at Waterville and at Moosehead Lake Outlet during log-driving season.

Flow at Moosehead Lake Outlet during log-driving season (May, June, and July).	Minimum flow at Waterville.				
	2,000.	2,500.	3,000.	3,500.	3,750.
Second-feet.					
0	16.3	24.1	32.0	41.1	46.1
500	16.3	24.1	32.0	41.1	46.1
1,000	16.3	24.1	32.0	41.1	46.1
1,500	16.3	24.1	32.3	41.4	46.1
2,000	16.3	24.5	33.6	42.7	47.3
2,500	17.6	26.7	35.7	44.8	49.4
3,000	21.6	30.1	39.1	48.2	....
3,500	24.9	34.0	43.0	52.1	....
4,000	28.8	37.9	....	....	....

The data in the above table have been plotted in fig. 8. Quantities of water available in billion cubic feet have been plotted as abscissas and minimum flows at Waterville in second-feet as ordinates. The slanting lines indicate the effect of different flows during the log-driving season. They are obtained by connecting points that represent the storage necessary for the various assumed minimum flows at Waterville, where the same flow is used for log driving. It will be noted that the lines representing a flow of 2,500 second-feet and over for log driving are straight and parallel; those representing 2,000 and 1,500 second-feet are straight and intersect the limiting line, marked 0 to 1,000 second-feet. The effect of different flows for log-driving purposes on required storage is clearly shown by this diagram, and, as would be expected for any minimum flow for log driving below, in general, about 1,500 second-feet, there is little or no change in storage required, because (1) either the quantity required for log driving is less than the amount needed to supply the

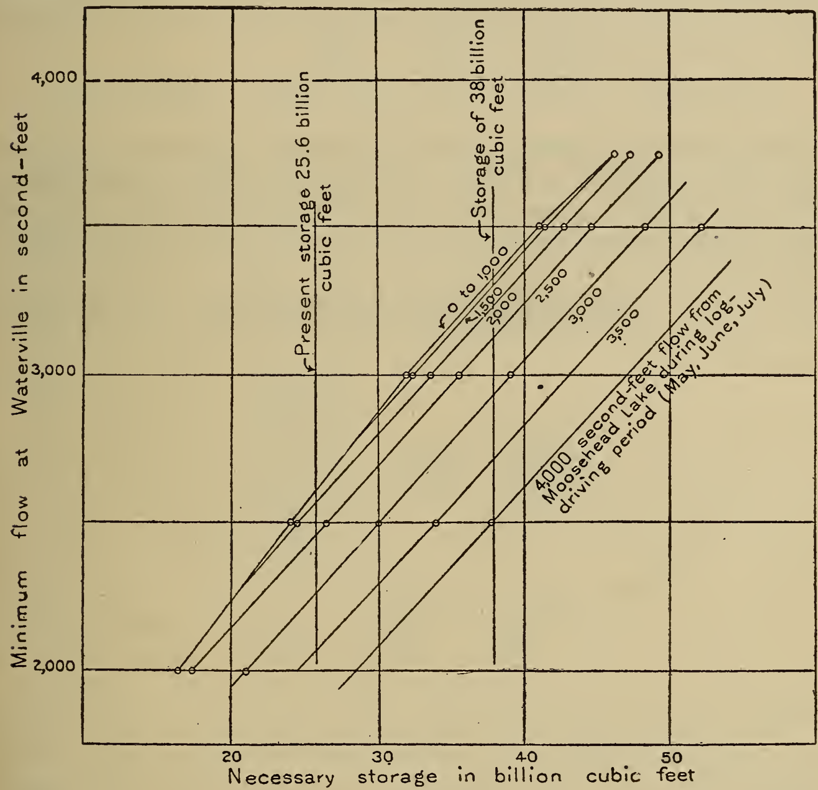


FIG. 8.—Diagram showing storage required in Moosehead Lake for various minimum flows at Waterville and for various quantities used log-driving period (May, June, and July).

deficiency in flow between Moosehead Lake Outlet and Waterville for a given month, as in July, 1903, or (2) there is a surplus flow into Moosehead Lake during the month as regards either the assumed flow for log driving or the quantity required to make up the deficiency in flow between Moosehead Lake Outlet and Waterville, as in May and June, 1903. As these two months are at the beginning of the period when water has to be stored, the effect is simply to raise the point A (fig. 7) and all points after it to February, 1904, inclusive, by the amount of the difference between the assumed minimum flows for log driving—hence the maximum ordinate remains the same in value.

The running together of the lines representing 0 to 2,000 second-feet (fig. 8) for the lower values of minimum flow at Waterville is occasioned by the relatively high flow into Moosehead Lake in August, 1903, as compared with all later months to February, 1904, inclusive, so that, when less than 1,500 to 2,000 second-feet are used for log driving, a surplus is available at Moosehead Lake in August, the high point A (fig. 7) will occur in August instead of July, and thereafter, for lower values of log-driving flow, the maximum ordinate will remain the same in value.

APPLICATION OF RESULTS OF "MASS CURVE" COMPUTATION.

With the present storage of about 25.6 billion cubic feet in Moosehead Lake and Long and Roach ponds (see p. 138), fig. 8 indicates that when different quantities are used for log driving the minimum flows and the corresponding horsepower at Waterville are as follows:

Minimum flow and corresponding horsepower at Waterville with storage of 25.6 billion cubic feet and various flows for log driving.

Flow at Moosehead Lake Outlet for log-driving (May, June, and July).	Minimum flow at Waterville.	Minimum net horsepower (75 per cent efficiency) at Waterville, corresponding to the 23-foot fall at Hollingsworth & Whitney dam.
Second-feet.	*Second-feet.*	
1,000	2,600	5,100
2,000	2,560	5,020
3,000	2,250	4,410

The mean monthly flow at Waterville has been as low as 921 second-feet (February, 1904), and has been below 2,250 second-feet (the minimum flow with 3,000 second-feet for log driving) many times. (See table of low-water flow at Waterville during 1903–4, p. 120.) Evidently the present storage has not been carefully utilized, and probably the amount of water used for log-driving purposes has exceeded an average of 3,000 second-feet for the three months considered.

With a storage of 38 billion cubic feet on Moosehead and Brassua lakes and Attean and Wood ponds (as given on p. 138) the results shown by fig. 8 are as follows:

Minimum flow and corresponding horsepower at Waterville with storage of 38 billion cubic feet and various flows for log driving.

Flow at Moosehead Lake Outlet for log driving (May, June, and July).	Minimum flow at Waterville.	Minimum net horsepower (75 per cent efficiency) at Waterville corresponding to the 23-foot fall at Hollingsworth & Whitney dam.
Second-feet.	*Second-feet.*	
1,000	3,340	6,530
2,000	3,240	6,350
3,000	2,940	5,760

In order to show the flow at Waterville during the entire period 1902–1906, if present storage and additional storage capacity had been properly utilized, fig. 9 has been prepared. This shows the following conditions: (1) Actual flow; (2) estimated flow without storage in Moosehead Lake; (3) estimated flow with present storage fully utilized, and a flow of 3,000 second-feet from Moosehead Lake during the log-driving period; and (4) estimated flow with a storage of 38 billion cubic feet and a flow of 1,000 second-feet from Moosehead Lake during the log-driving period.

The advisability of carefully regulating the flow from Moosehead Lake and other storage reservoirs and of limiting the quantity let out for log driving to perhaps 1,000 second-feet is clearly shown by fig. 9 and the preceding tables. With a storage of 38 billion cubic feet, not less than about 6,500 net horsepower would be available at Waterville dam in another such series of dry years, and even with the present storage, 5,100 horsepower should be available at all times.

Other water powers along the river would benefit in about the same proportion. The effect of this regulation on the flow at Moosehead Lake Outlet is indicated by fig. 10, which shows (1) the estimated flow at the outlet of Moosehead Lake without storage, and (2) the estimated flow at the outlet with enough storage to give a flow of 1,000 second-feet during the log-driving months and a minimum flow of 3,340 second-feet at Waterville. As indicated on this figure, there would be usually one or two months in the year when no water would be let out of the lake. These would in general, however, be the early spring months, when the run-off all along the river is large; so that even under this assumption the flow in this part of the river would be fully as great as at present. Moreover, the storage possibilities of Moxie and Pierce ponds and the Dead River Lakes have not been considered in these computations. The proper regulation of storage on these ponds will provide enough water to maintain the required

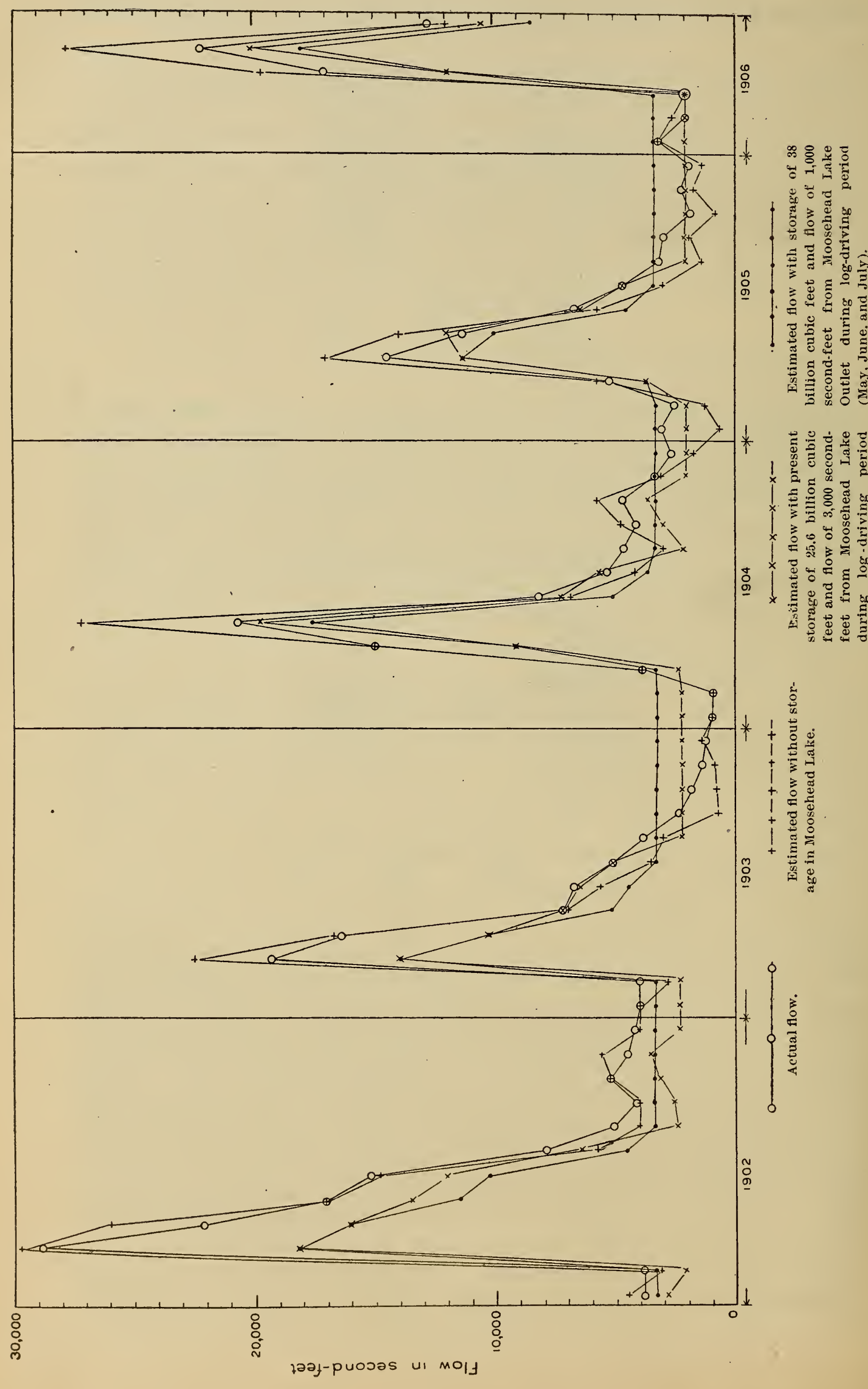


FIG. 9.—Diagram showing flow of Kennebec River at Waterville and estimated flow with and without storage in Moosehead Lake.

minimum flow on the lower river, and as a result sufficient water to provide for future power developments above The Forks can be released from Moosehead Lake at all seasons.

CONCLUSIONS.

The foregoing computations and results are not to be considered absolute or final. A longer series of dry years or a more severe distribution of drought would require more storage to provide the minimum flow, as indicated. But it is reasonably certain that as such a series of dry year has occurred, it may do so again, and it may be concluded that at least the quantity of storage as computed here will be needed. All the additional storage that can readily be obtained in Moosehead and Brassua lakes and Long, Attean, and Wood ponds can be used to

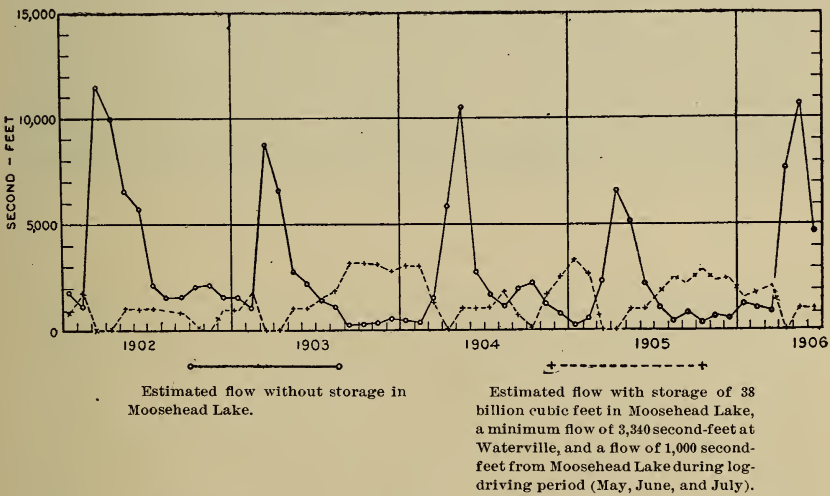


FIG. 10.—Diagram showing estimated flow from Moosehead Lake with and without storage.

advantage, and it is probable that a storage in addition to that mentioned would be desirable. In order to assist in the regulation of flow on the main river, as well as to aid in development of the power on the tributary streams, additional storage on the lakes in the Dead River basin and on Moxie and Pierce ponds is only second in importance to that in and above Moosehead Lake.

Two essentials must be kept in mind, however, or much of the effect of additional storage will be lost:

(1) Water must not be wasted in log driving.

(2) The flow from Moosehead Lake and other principal reservoirs must be carefully regulated and watched.

All reservoirs should always be kept as nearly full as possible, and water should be retained as far upstream in the storage system as possible. The quantity of water let out should not be greater than that needed to furnish the required flow on the river at such points as Waterville and The Forks.

LOG DRIVING AND LUMBERING.

GENERAL STATEMENT.

The forests of Maine constitute one of her most important natural resources, and, as previously stated, about one-third of the lumber used for pulp and paper in the State comes down the Kennebec waters. The annual "drive" in the main river usually amounts to about 150,000,000 feet B. M., and a large part of the population in the Kennebec Valley, especially near the headwaters, are engaged in handling the logs, from the stump to the finished product of the mill, or in furnishing the supplies and equipment needed to carry on this industry.

The logs are hauled from the cuttings and piled along the banks of the stream during the winter. On the breaking up of the ice in the spring these piles or landings are rolled into the stream and the logs floated downstream with the current. Boats are used in towing the logs across lakes or where the current is not strong enough to carry them along. On many of the smaller streams there are dams which impound the water, and the head thus obtained is used in sluicing and carrying the logs down to the larger streams. (See Pl. V, *B* (p. 128), for a typical dam of this kind.) After the "drive" is over, the gates are left open and the flow becomes a natural one. These dams are necessary on the smaller streams, as the channels are so obstructed with bowlders and small islands that it requires a large amount of water to force the logs downstream. In a general way the same conditions exist on the larger tributaries and on the main river, although the difficulty in driving is here caused usually by a short stretch of narrow and rough channel or by gravel bars. Pl. VII, *B*, shows a portion of the main river just below Madison, where log jams very frequently occur, and Pl. VII, *A*, shows one of the worst jams in recent years just above the railroad bridge at Madison. About 30,000,000 feet of logs were piled up, filling the river to the bottom and raising the upstream water level several feet.

Since about 1830 the Kennebec Log Driving Company has controlled the drives in the main river. Other similar associations are the Moose River Driving Company and the Dead River Driving Company, and from the reports of these three companies a large part of the following data is compiled.

A. LOG JAM IN KENNEBEC RIVER ABOVE MADISON, ME.

B. KENNEBEC RIVER BELOW MADISON, ME.

TIME OF DRIVING.

The smaller tributary streams are driven just as soon as the ice goes out of them in the spring—usually about the latter part of April. The Moose River drive usually reaches Moosehead Lake in the latter part of May, and at about the same time the Dead River drive enters the Kennebec. Moosehead Lake is clear of ice, usually, at least, by May 10, and from that time until perhaps about August 1, depending on the season, water is let out of Indian Pond (which is used as a regulating basin) for varying periods each day. The times when the rear of the drive has left Moosehead Lake and reached Riverside boom (about 5 miles above Augusta) for the six years 1900 to 1905 are given below:

Dates on which rear of drive left Moosehead Lake and reached Riverside boom.

Year.	Left Moosehead Lake.	Reached Riverside boom.
1900	June 23	August 27.
1901	July 3	August 9.
1902	June 15	August 15.
1903	July 5	September 9.
1904	July 2	September 8.
1905	July 24	August 27.

WATER USED IN DRIVING.

The period during which water is let out of Indian Pond dam lasts usually from about May 1 to August 15, although the most water is used during June and July. No record is kept of the flow at this dam or of the length of time the water runs out, although a man is stationed there to control the flow according to the needs of the drive. An inspection of gage readings at The Forks gaging station shows that the duration of the season during which water is let out for log driving is approximately as follows:

Length of period during which water is released for log driving.

1902	May 10 to August 6.
1903	April 26 to August 23.
1904	May 14 to August 16.
1905	May 1 to September 3.
1906	May 1 to August 10.

An estimate of the flow at Moosehead Lake Outlet during the last three years is presented in the subjoined table, based on (1) the measured flow of Moose and Roach rivers; (2) the evaporation and precipitation on the lake; (3) the change in the lake level during a given month. The flow at The Forks gaging station is also given for comparison.

Estimated monthly discharge, in second-feet, of Kennebec River from Moosehead Lake and at The Forks, May to August, 1904–1906.

	May.			June.			July.			August.		
	1904.	1905.	1906.	1904.	1905.	1906.	1904.	1905.	1906.	1904.	1905.	1906.
Moosehead Lake	900	3,000	2,700	4,300	3,900	4,100	2,300	3,000	3,900	2,300	2,000	2,400
The Forks	5,060	4,330	7,440	6,510	5,410	5,720	5,650	4,060	4,310	2,970	2,070	2,740

The present amount of water let out at Indian Pond dam during the log-driving season is apparently about as follows, by months: May, 3,000 second-feet; June, 4,000 second-feet; July, 3,000 second-feet; August, 2,000 second-feet.

QUANTITIES OF LOGS DRIVEN AND COST OF DRIVING.

The following table shows the amount and cost of the four principal drives for the six years 1900–1905. Except for the Moose River drive the amount of tax per thousand feet B. M. of logs is also given and the amount of logs to which this tax was applied, the latter figure taking into account the difference in distance driven, which varies for the different mills along the river. The full tax is for the following distances:

(1) On Kennebec River from The Forks to Riverside boom (about 5 miles above Augusta), 91 miles.

(2) On Kennebec River from Moosehead Lake Outlet to The Forks, 24 miles.

(3) On Dead River from North Branch to The Forks, 43 miles.

It must be kept in mind that these figures cover, in addition to the cost of driving itself, the other charges arising in carrying on this work, such as cost of dams, improvement of channel, booms, etc., as well as executive charges. As many important improvements have been made during these six years, such other expenses have been heavy, and the unit costs of driving are therefore higher than if a longer series of years were considered.

Amount and cost of log driving on Kennebec River and tributaries, 1901–1905.

Year.	Kennebec River from The Forks to Riverside boom.				Kennebec River from Moosehead Lake Outlet to the Forks.			
	Amount driven.	Amount taxed.	Total cost.	Tax per M.	Amount driven.	Amount taxed.	Total cost.	Tax per M.
	Feet B. M.	*Feet B. M.*			*Feet B. M.*	*Feet B. M.*		
1900	147,424,579	136,418,020	$54,567.20	$0.40	83,297,162	83,297,162	$4,997.83	$0.06
1901	136,063,291	125,744,768	50,297.90	.40	91,765,535	78,953,778	11,843.07	.15
1902	133,772,610	122,655,300	55,194.85	.45	86,391,882	74,707,784	11,206.15	.15
1903	146,413,732	135,098,090	67,549.07	.50	95,763,334	83,078,837	12,461.82	.15
1904	163,894,303	150,476,608	51,162.05	.34	112,702,582	99,907,353	9,990.76	.10
1905	132,025,401	121,274,346	43,658.76	.36	97,655,501	82,844,976	9,112.96	.11

Amount and cost of log driving on Kennebec River and tributaries, 1901–1905—Cont'd.

Year.	Dead River.				Moose River.	
	Amount driven.	Amount taxed.	Total cost.	Tax per M.	Amount driven.	Total cost.
	Feet B. M.	*Feet B. M.*			*Feet B. M.*	
1900	47,208,011	40,790,202	$14,276.57	$0.35	30,495,221	$10,37[illegible].70
1901	39,730,456	32,862,021	11,501.71	.35	30,699,729	13,151.59
1902	44,215,878	34,705,943	13,882.39	.40	35,403,382	13,3[illegible]6.61
1903	45,081,154	33,705,719	13,482.28	.40	41,636,226	18,884.88
1904	38,023,533	31,314,718	10,960.17	.35	45,386,208	17,619.09
1905	25,294,441	22,070,364	9,931.68	.45	41,936,725	18,212.36

From the above table we can obtain the cost of driving per mile-thousand, considering the amounts taxed and the distances as previously given, and approximately the cost per ton-mile, considering 1,000 feet B. M. to weigh 3,500 pounds. For Moose River the distance given is computed and is an average one from Moosehead Lake, the various amounts and distances driven being taken into consideration.

Cost of log driving on Kennebec River and tributaries, 1901–1905.

Drive.	Distance.	Average tax per M.	Cost of driving.	
			Per mile-thousand.	Per ton-mile.
	Miles.			
Kennebec River from The Forks to Riverside boom	91	$0.41	$0.0045	$0.0026
Kennebec River from Moosehead Lake to The Forks	24	.12	.0050	.0028
Dead River	43	.38	.0089	.0051
Moose River	17		.024	.014
Moosehead Lake (Moose River to lake outlet, logs towed by boat)	9	[a].12	.013	.0074

[a] Contract price for ten years.

It appears that the cost of log driving per ton-mile varies from about one-fourth to 1½ cents, depending on the distance driven and difficulties experienced. The average freight rate in the United States at present is about 0.8 cent per ton-mile, and for the New England group of railroads 1.20 cents per ton-mile. Under exceptionally favorable circumstances rates as low as 0.2 cent per ton-mile have been granted for coal transportation from the coal fields to tide water. Rates during 1906 for log transportation on the new Somerset Railway extension are of interest in this connection, and are given below through the courtesy of Hon. William T. Haines:

Cost of transportation of logs by rail.

Logs shipped from Moscow to—	Average distance.	Charge per thousand feet B. M.	Cost of transportation.	
			Per mile-thousand.	Per ton-mile.
	Miles.			
Bingham	12	$1.75	$0.146	$0.080
Solon	20	2.00	.100	.057
North Anson	29	[a]1.50	.052	.030

[a] This price involves reshipment as manufactured lumber on Somerset Railway.

The average freight rate on the Somerset Railway for 1904 was 2.74 cents per ton-mile.

The cost of water transportation of logs is thus seen to be very low, and for many years the bulk of the logs will probably be river driven, where it can be done, although there is unquestionably much timber that will have to be taken out by rail.

IMPROVEMENTS IN LOG-DRIVING FACILITIES.

During the five years 1901–1905 the Kennebec Log Driving Company has spent on the Kennebec the following amounts for items relating especially to channel improvements. About one-half of the cost of main dams has been paid by the Kennebec Water Power Company.

Amounts spent for improving channel of Kennebec River, 1901–1905.

Removing gravel beds for channel	$1,100
Blasting out rock for channel	2,200
Building and repairing piers	4,700
Building and repairing side dams, or "bumpers"	1,200
Building and repairing main dams	65,000

In 1896 the late Sumner Hollingsworth, engineer for the Hollingsworth & Whitney Company, reported to the Kennebec Water Power Company on the general subject of channel improvement of the upper Kennebec, advocating the beginning of such work, so that eventually the drive in this part of the river could be made with a flow of 1,000 second-feet from Moosehead Lake. Some of the worst places have been improved, but much remains to be done in removing bowlders and building log bumpers before the drive can be made on so small a flow. On Dead River from the Dead River dam to The Forks very large quantities of water are required in driving, as the bed of the river is extremely rough. Much work could be done here to advantage in removing bowlders, etc.

Fred T. Dow, engineer for the Kennebec Water Power Company, in a report made during 1906, advocates a systematic plan of improvement of both the Kennebec River and Dead River channels, to be completed during the next eight or ten years, and calls especial attention to the necessity of checking freshet flow as far as possible by storage reservoirs to prevent the washing of high banks and the subsequent formation of new gravel bars.

QUALITY OF KENNEBEC RIVER WATER.

By George C. Whipple.

INTRODUCTION.

In 1903 and 1904 appraisals were made of the water supplies of the cities of Waterville and Augusta, Me., in connection with a transfer of those works from private companies to so-called "water districts," which virtually stood for the municipalities. In these appraisals the quality of the water supplied by the private companies played an important part, especially as both cities had been visited by severe epidemics of typhoid fever during the winter of 1902–3. Waterville was at that time supplied by the Maine Water Company with water from Messalonskee, but the company had also the right to use water from the Kennebec. Augusta was supplied with Kennebec River water by the Augusta Water Company.

In order to obtain sufficient evidence as to the quality of these water supplies, many samples of water were collected from Messalonskee and Kennebec rivers in the vicinity of these two cities and also from a number of the tributary streams and neighboring ponds. In connection with the typhoid epidemics, numerous samples of well water were analyzed, both in Waterville and Augusta, and in connection with the search for new sources of supply, which have since been introduced at both places, analyses of water from various local lakes and ponds were made. This body of analytical data, taken together, serves to give a fairly accurate picture of the quality of the Kennebec River water in its middle portion, as well as that of some of the lakes and streams of its drainage basin. Moreover, the Kennebec itself, lying in the central part of the State and flowing, as do most of the Maine rivers, in a general southerly or southeasterly direction from the Canadian boundary to the Atlantic Ocean, is in regard to the general quality of its water typical of the large rivers of the State.

The analytical records extend over a period of but one year, during which the general stage of the water was below the average. This fact should be remembered in considering the results. The average color of the water, for instance, as shown by the figure given, is probably somewhat lower than it would be under ordinary conditions, and this is also true, though in a less degree, of the turbidity. The hardness of the water, on the contrary, as here given is probably above the general average for an ordinary year.

The general topographic and geologic characters of the Kennebec River drainage area are discussed elsewhere in this paper (pp. 4–9), but in connection with the results of the analyses it is well to recall that the basin is densely wooded in its upper portion and that its lower portion is more open and given to cultivation. Taken as a whole, the percentage of cultivated land on the watershed is very small. The rock formations are largely granitic and there are no deposits of limestone. The soil is mainly glacial drift. There are comparatively few deposits of clay, although these are not entirely absent. An important feature of the drainage area is the large percentage of water surface. An inspection of the map will show that it is essentially a lake country. Most of the population is concentrated near the river banks, especially at points where there are good water powers. Exclusive of the river towns, the population of the basin is extremely small.

The river is used very largely for logging, and during the driving period logs pass in an almost continuous mass from Moosehead Lake to Gardiner. There are numerous manufacturing establishments at the centers of population. Most of these are pulp and paper mills, sawmills, and cotton mills. The sewage from the cities, the manufacturing wastes from these establishments, and the log driving on the river constitute the three principal sources of pollution of the water. Below Augusta the river is a tidal estuary, and the effect of the sea water is at times very noticeable. The water of the river is used by several of the towns and cities along its banks, and great quantities of ice are cut in the lower reaches and shipped to places farther south. The quality of the water is, therefore, a matter of very great importance to many people.

In studying the quality of the water of this river it will be convenient to look first at its normal or natural quality, especially in regard to such physical characteristics as turbidity, color, taste, and odor, and afterwards to take up the sources of pollution and their effects.

WATER EXAMINATIONS.

All the analyses were made substantially in accord with the standard methods of water analysis adopted by the American Public Health Association.

TURBIDITY.

The turbidity of the water of Kennebec River at Waterville and Augusta is shown in the tables on pages 172–177. From these it will be seen that the turbidity has varied at different times from 2 to 60 on the silica scale. During the early part of 1903 very few observations were made, and there is good reason to believe that in the spring of that year the turbidity considerably exceeded the maximum amount observed, probably reaching 200 or 300 for short periods. During the spring of 1904, when the river was at an unusually low stage for that season of the year, the maximum turbidity did not exceed 15. The average turbidity for the year was 9. From the middle of August, 1903, until the middle of March, 1904, daily observations were made at Augusta, and the results for that period are therefore much more reliable than the scattering figures obtained during the first half of 1903. The average turbidity at Augusta for the period stated was 6. During August, September, and a part of October it seldom exceeded 5. In the latter part of December, however, it increased and for over a week remained higher than 15. After the river froze over in the winter the turbidity again fell, and the water remained comparatively clear. At this time a large proportion of the suspended matter found was of organic origin; some of it evidently consisted of fragments of wood pulp discharged from the pulp and paper mills. This was indicated by the stringy appearance of the suspended matter when allowed to settle quietly in a bottle; but a more positive test was given with a microscope, which showed unmistakably the presence of fragments of wood fiber.

The turbidity of the water in Messalonskee Stream, which flows into the Kennebec just below Waterville, was at times greater than that of the Kennebec itself. This is shown by the figures given in the table on pages 177–181. After rains the turbidity of this water increases very rapidly, even in a few hours. The Messalonskee drains a chain of lakes, and its natural water would be very clear were it not for a small tributary which cuts through a number of clay deposits and which becomes very turbid after a heavy rain. This brook also receives the surface wash from numerous farms, which adds to its turbidity.

Besides the clay and the organic sediment already mentioned, the suspended matter of the Kennebec after heavy rains consists of river silt, which has a comparatively high coefficient of fineness and settles rapidly as soon as the velocity of the water has decreased. In certain reaches of the river, therefore, deposits of river silt have been formed. Sedimentation has been favored by the numerous dams along the stream, which cause long stretches of backwater. Between Waterville and Augusta the mud deposits are extensive, and because of the large amount of sewage discharged at Waterville they become foul and ill smelling at times of low water. Without doubt this settling of the river sediment in the long stretch of backwater behind the Augusta dam had an important effect on the quality of the water supply of Augusta when it was taken from the river. These deposits are referred to again in connection with the subject of pollution (p. 188).

COLOR.

Like that of most of the rivers in Maine, the Kennebec River water has a deeply stained appearance at certain seasons of the year. The variations in color are shown in the tables on pages 172–177. From these tables it will be seen that the color of the river water varied during the period covered by the observations from 15 to 108, and that the average color of the water was 37. The maximum color occurred in June. From that time until the latter part of the year the color steadily decreased. In December and January an increase in color accompanied the rise of turbidity, but the maximum did not exceed 43. During the winter when the streams were frozen the color dropped rapidly and remained between 20 and 30 for several months.

The figures given in the tables all refer to the apparent color of the water, but the removal of the suspended matter by filtering through coarse filter paper did not ordinarily reduce the color by more than 10 or 15 per cent. Filtration through a Berkfeld filter, however, removed approximately one-third of the color, indicating that a considerable part of it was due to organic matter in an extremely fine state of division. A second filtration through a Berkfeld filter did not show a subsequent removal of color to any extent. It may be said, therefore, that approximately two-thirds of the color was due to dissolved organic matter and that the balance was due to organic matter in a colloidal or finely divided state of suspension.

The source of the color is to be sought chiefly in the swampy areas lying in the upper portions of the basin, where leaves, roots, twigs, the bark of fallen logs, and vegetable mold are continually being leached by the standing water. After a period of storage in these swampy areas, these leachings are washed into the streams at times of rain and add their quota to the color of the water. It will be noticed that the maximum color occurs in the spring, after the snow and ice have disappeared and the swamps have discharged their contents into the rivers. As the brooks dry up in summer, the amount of coloring matter contributed by them decreases, and the color of the river water falls. There is a secondary maximum in the fall or early winter due to the autumnal rains; but during the fall of 1903, which was exceptionally dry, this maximum was inconspicuous, although there was a slight increase in color early in September. During the winter the river and small tributary streams freeze, and the amount of water which the latter contribute decreases very greatly and sometimes ceases entirely, the streams meantime being fed largely by ground water. The result of this is that in the winter the color of the water reaches its lowest point.

It has been thought by many that some of the color shown by the water of the river in early summer may be attributed to the logs which are floated down the river, the bark obtaining its initial extraction during the early months of the year. In order to determine to what extent this was a factor, some experiments were made in a laboratory temporarily installed at Waterville by Dr. Ernest C. Levy. Samples of bark from logs recently cut were put into jars with 1,500 c. c. of colorless spring water. These were allowed to stand and the colors were read at the end of five days and again at the end of twenty-five days. In each sample the bark was attached to the wood. The following figures show the results obtained:

Effect of bark on color of water.

Kind of wood.	Bark surface (square centimeter).	Color (parts per million).					
		After 5 days.	After 25 days.	Per liter for each 100 square centimeter of bark surface.		Per gallon of water per square foot of bark.	
				5 days.	25 days.	5 days.	25 days.
Fir	60	40	40	102	102	247	247
White pine	56	70	110	188	236	455	578
Spruce	78	90	160	172	308	416	753
Juniper	56	90	200	242	536	591	1,320
Norway pine	60	110	240	250	600	605	1,465
Hemlock	66	140	260	319	667	772	1,630
Cedar	65	140	300	239	690	580	1,685
Average	63	83	187	216	448	524	1,098

From the above figures it will be seen that cedar and hemlock are the most active of the fir trees of Maine in giving color to water. In round numbers, it may be said that 1 square foot of bark will increase the color of 1,100 gallons of water by one unit of the ordinary scale of measurement after an exposure of one month. The ordinary log of the Kennebec River drives has about 70 square feet of bark surface. Therefore one log would increase the color of 77,000 gallons of water one unit after standing in it for about a month. Further calculations show that 1,000 feet B. M. of lumber will increase the color of 616,000 gallons of water about one unit during the same time. Inasmuch as the average flow of Kennebec River is about 3,500,000,000 gallons per day, it would require 50,000 logs a day to increase the color of the river water by one point. This is four or five times the number of logs floated per day from April to July. Therefore it will be seen that this factor is entirely negligible in the consideration of the color of the Kennebec water. If, however, the logs stand in the water of swamps for more than this length of time, there is a chance that they might give a slight color to the river water.

ODOR.

The water of the Kennebec River has at all times a swampy or peaty odor and taste, usually described by the term "vegetable;" but during the spring, when the color of the water is high, the odor becomes more distinct. It is due in great measure to the same organic compounds which give to the water its color, and represents the effect of the natural leaching of the decaying organic matter in the various swamps scattered over the drainage area.

In addition to this natural swampy taste, the water of the river at certain points below the centers of industry has at times a very marked taste, due to the discharge of sewage and manufacturing wastes into the stream. This is further discussed under the heading "Pollution" (pp. 194–195).

During the period covered by the analyses no odors due to algæ or other microscopic organisms were observed.

RESULTS OF EXAMINATIONS.

Results of examination of Kennebec River water above Waterville.

Date.	Turbidity.	Color.	Bacteria per cubic centimeter.	Bacillus coli.[a]		
				In 0.1 c. c.	In 1 c. c.	In 10 c. c.
1903.	*Parts per million.*	*Parts per million.*				
January 19	2	37	400	...	...	...
February 16	...	...	2,750	−	+	+
February 27	0	34	3,500	+	+	+
March 12	60	50	4,400	+	+	+
March 18[b]	...	...	2,350	−	+	+
March 21	...	...	1,800	−	+	+
March 28	...	...	605	−	+	+
April 4	15	45	635	+	+	+
April 14	18	40	660	−	+	+
April 18	10	40	470	−	−	−
April 28	10	28	240	−	+	+
May 12	6	38	1,100	+	+	+
May 23	5	36	640	−	+	+
June 3	8	36	1,500	−	+	+
June 14	48	100	15,000	+	+	+
June 15	16	108	...	...	...	...
June 16	12	100	6,800	−	+	+
June 17	10	96	...	...	...	...
June 23	5	56	1,900	+	+	+
July 14	20	40	110	−	−	+
August 5	10	50	...	−	+	+
August 17	3	38	600	−	+	+
August 20	4	36	250	−	−	−
August 22	3	38	360	+	+	+
August 25	2	42	...	−	−	+
August 27	2	58	220	−	+	+
August 29	2	50	145	−	−	+
September 1	2	42	900	−	+	+
September 14	3	38	185	+	+	+
September 15	...	...	320	+	+	+
September 18	4	38	300	−	−	+
September 22	7	38	380	−	+	+
September 26	...	...	220	−	+	+
September 30	...	...	185	−	+	+
Average	11	51	1,631	...	...	...
Per cent giving positive test	...	...	...	30	81	94

[a] Plus sign indicates the presence and minus sign the absence of this organism.
[b] This sample was taken at Fairfield.

Results of examination of Kennebec River water at intake of Augusta waterworks.

AUGUST, 1903.

Day.	Turbidity.	Color.	Odor.[a]	Bacteria per cubic centimeter.	Bacillus coli.[b] In 0.01 c. c.	In 0.1 c. c.	In 1 c. c.	In 10 c. c.
	Parts per million.	*Parts per million.*						
20	2	29	1v	280	....	....	....	....
25	5	32	....	260	....	−	−	+
27	3	42	....	305	....	+	+	+
28	2	38	2v 3w	475	....	−	−	−
29	2	38	2v 3w	225	....	+	+	+
30	2	37	2v 3w	290	....	−	−	−
31	3	45	2v 3w	360	....	−	−	+
Average	3	36	2v 3w	313	....	....	....	....
Per cent giving positive test	....	....	....	....	....	33	33	66

SEPTEMBER, 1903.

Day.	Turbidity.	Color.	Odor.	Bacteria per cubic centimeter.	Bacillus coli. In 0.01 c. c.	In 0.1 c. c.	In 1 c. c.	In 10 c. c.
1	4	36	2v 3w	740	....	−	−	−
2	3	44	2v 3w	490	....	−	+	+
3	3	42	2v 3w	210	....	−	+	+
4	3	43	2v 3w	405	....	−	+	+
5	4	45	3v 3w	390	....	−	−	−
6	3	41	2v 3w	300	....	+	+	+
7	3	42	2v 3w	230	....	+	+	+
8	4	39	2v 3w	260	....	+	+	+
9	3	42	2v 3w	365	....	−	−	+
10	3	42	2v 3w	380	....	−	+	+
11	3	37	2v 3w	260	....	−	+	+
12	3	39	2v 3w	235	−	−	+	....
13	3	32	2v 3w	410	−	−	+	....
14	4	33	2v 3w	610	+	+	+	....
15	2	33	2v 3w	235	−	−	−	....
16	3	33	1v 3w	315	−	+	+	....
17	4	33	1v 3w	420	−	−	+	....
18	3	33	1v 3w	345	−	−	−	....
19	5	34	1v 3w	540	−	−	+	....
20	3	34	1v 3w	585	−	+	+	....
21	4	34	1v 3w	615	−	−	+	....
22	3	32	1v 3w	370	−	−	+	....
23	3	32	1v 3w	590	−	+	+	....
24	2	34	1v 3w	830	−	+	+	....
25	3	33	1v 3w	605	−	−	+	....
26	3	33	1v 3w	735	−	+	+	....
27	5	29	2v 3w	720	−	+	+	....
28	5	32	2v 3w	480	−	−	−	....
29	2	32	2v 3w	405	−	−	+	....
30	3	32	2v 3w	455	−	−	+	....
Average	3	36	2v 3w	451	....	....	....	....
Per cent giving positive test	....	....	....	....	5	33	80	82

[a] v=Vegetable odor; w=woody odor (due to paper-mill wastes); g=grassy odor. The intensity of the odor is indicated by the following scale: 1, Very faint—an odor that would not ordinarily be detected by the average consumer, but that could be detected in the laboratory by an experienced observer; 2, faint—an odor that the consumer might detect if his attention were called to it, but that would not otherwise attract attention; 3, distinct—an odor that would be readily detected and that might cause the water to be regarded with disfavor; 4, decided—an odor that would force itself on the attention and might make the water unpalatable; 5, very strong—an odor of such intensity that the water would be absolutely unfit to drink, a term to be used only in extreme cases.

[b] Plus sign indicates the presence and minus sign the absence of the organism.

Results of examination of Kennebec River water at intake of Augusta waterworks—Cont'd.

OCTOBER, 1903.

Day.	Turbidity.	Color.	Odor.[a]	Bacteria per cubic centimeter.	Bacillus coli. In 0.01 c. c.	In 0.1 c. c.	In 1 c. c.	In 10 c. c.
	Parts per million.	*Parts per million.*						
2	3	34	2v 3w	310	—	+	+	....
3	2	33	1v 2w	290	—	+	+	....
4	5	33	....	315	—	—	—	....
5	6	34	....	510	—	—	—	....
6	6	28	1v 2w	295	—	—	—	....
7	4	32	1v 2w	415	—	—	—	....
8	6	28	1v 2w	410	—	+	+	....
9	5	28	1v 2w	375	—	—	+	....
10	5	31	2v 1w	360	—	—	+	....
11	5	33	2v 1w	340	—	—	+	....
12	4	30	2v 1w	450	—	+	+	....
13	6	30	2v 1w	350	—	+	+	....
14	7	32	2v 1w	345	—	+	+	....
15	5	31	2v 1w	420	—	—	+	....
16	8	31	2v 1w	980	—	—	+	....
17	7	31	2v 1w	585	—	—	+	....
18	4	29	2v 1w	945	—	—	+	....
19	6	30	2v 1w	630	—	+	+	....
20	6	30	2v 1w	330	—	—	+	....
21	6	30	2v 1w	410	—	—	+	....
22	6	29	2v 1w	760	—	+	+	....
23	7	28	2v 1w	1,040	—	+	+	....
24	5	28	2v 1w	685	—	—	+	....
25	4	29	2v 1w	535	—	—	—	....
26	5	30	2v 1w	725	—	—	—	....
27	6	27	2v 1w	820	—	—	+	....
28	5	28	2v 1w	820	—	—	+	....
29	5	30	2v 1w	540	—	+	+	....
30	5	30	2v 1w	410	—	—	+	....
31	4	30	2v 1w	575	—	—	+	....
Average	5	30	2v 1w	532	....	....	....	....
Per cent giving positive test	....	....	....	....	—	33	80	....

NOVEMBER, 1903.

Day.	Turbidity.	Color.	Odor.[a]	Bacteria per cubic centimeter.	Bacillus coli. In 0.01 c. c.	In 0.1 c. c.	In 1 c. c.	In 10 c. c.
1	5	30	2v 1w	725	—	—	—	....
2	5	30	2v 1w	720	—	—	—	....
3	5	30	2v 1w	700	—	—	—	....
4	5	29	2v 1w	600	—	—	—	....
5	4	29	2v 1w	475	—	+	+	....
6	6	29	2v 1w	385	—	—	—	....
7	10	33	2v 1w	570	—	—	+	....
8	10	32	2v 1w	520	....	+	+	+
9	10	31	2v 1w	580	....	—	+	+
10	12	31	2v 2w	625	....	—	+	+
11	10	32	2v 2w	590	....	—	—	+
12	9	33	2v 2w	655	....	—	+	+
13	5	31	2v 2w	695	....	—	—	+
14	6	32	2v 2w	500	....	+	+	+
15	8	33	2v 2w	350	....	—	—	+
16	8	32	2v 2w	830	....	—	+	+
17	6	32	2v 2w	175	....	—	—	+
18	5	30	2v 2w	750	....	—	+	+
19	6	33	2v 2w	650	....	+	+	+
20	4	30	2v 2w	750	....	—	—	+
21	5	33	2v 2w	830	....	+	+	+
22	5	33	2v 2w	595	....	—	+	+
24	....	....	....	860	....	—	—	+
25	....	....	....	845	....	—	+	+
26	....	....	....	(a)	....	....	....	....
27	....	....	....	(a)	....	....	....	....
28	6	30	2v 2w	(a)	....	—	—	+
29	7	32	....	(a)	....	+	+	+
30	4	33	....	....	....	—	+	+
Average	7	31	2v 2w	624	—	22	56	100
Per cent giving positive test	....	....	....	....	....	....	....	....

[a] Plates liquefied because of poor lot of gelatin.

Results of examination of Kennebec River water at intake of Augusta waterworks—Cont'd.

DECEMBER, 1903.

Day.	Turbidity.	Color.	Odor.[a]	Bacteria per cubic centimeter.	Bacillus coli. In 0.01 c. c.	In 0.1 c. c.	In 1 c. c.	In 10 c. c.
	Parts per million.	*Parts per million.*						
1	5	32	2v 2w	....	....	−	+	+
2	3	33	2v 2w	....	....	+	+	+
3	6	33	2v 2w	2,155	....	−	+	+
4	6	33	2v 2w	2,000	....	−	+	+
5	3	31	2v 2w	2,200	....	+	+	+
6	3	32	2v 2w	6,345	....	+	+	+
7	7	30	2v 2w	3,330	....	−	+	+
8	4	31	2v 2w	4,450	....	−	−	−
9	5	33	2v 2w	4,550	....	+	+	+
10	3	33	2v 2w	....	....	−	−	−
11	6	33	2v 2w	2,200	....	−	−	−
12	10	32	2v 2w	4,400	....	−	−	−
13	7	15	2v 2w	5,500	....	+	+	+
14	5	32	2v 2w	5,250	....	−	−	−
15	5	32	2v 2w	3,150	....	+	+	+
16	8	30	2v 2w	5,600	....	−	−	−
17	6	33	2v 2w	5,700	....	+	+	+
18	6	28	2v 2w	5,500	....	−	−	−
19	10	28	2v 2w	5,500	....	−	+	+
20	12	28	2v 2w	4,500	....	+	+	+
21	10	28	2v 2w	3,900	....	+	+	+
22	20	40	2v 2w	5,900	....	+	+	+
23	25	35	2v 2g 2w	1,180	....	−	+	+
24	30	33	2v 2g 2w	7,750	....	+	+	+
25	30	34	2v 2g 2w	11,900	....	+	+	+
26	25	36	2v 2w	21,500	....	−	+	+
27	22	36	2v 2w	6,250	....	+	+	+
28	25	36	2v 2w	6,500	....	+	+	+
29	25	37	2v 2w	11,600	....	+	+	+
30	15	34	2v 2w	35,700	....	+	+	+
31	15	34	2v 2w	37,450	....	+	+	+
Average	12	32	2v 2w	7,927	....	....	....	....
Per cent giving positive test	....	....	....	....	....	45	78	78

JANUARY, 1904.

Day.	Turbidity.	Color.	Odor.[a]	Bacteria per cubic centimeter.	Bacillus coli. In 0.01 c. c.	In 0.1 c. c.	In 1 c. c.	In 10 c. c.
1	12	40	2v 2g	283,500	....	+	+	+
2	12	41	2v 2g	1,555	....	−	−	−
3	....	....		11,700	....	−	−	−
4	10	42	2v 2g	43,500	....	−	+	+
5	8	42	2v 2g	51,000	....	+	+	+
6	10	42	2v 2g	39,500	....	+	+	+
7	6	43	2v 2g	30,500	....	+	+	+
8	5	42	2v 2g	40,000	....	+	+	+
9	8	37	2v 2g	41,000	....	+	+	+
10	....	....	....	40,000	....	−	+	+
11	5	40	2v 2g	56,500	....	−	−	+
12	5	38	2v 2g	38,000	....	−	−	−
13	5	37	2v 2g	20,500	....	−	−	−
14	5	36	2v 2g	37,000	....	+	+	+
15	3	38	2v 2w	23,000	....	+	+	+
16	10	33	2v 2g	9,000	....	+	+	+
17	3	32	2v 2g	19,500	....	−	+	+
18	3	33	2v 2g	10,000	....	+	+	+
19	2	32	2v 2g	14,500	....	+	+	+
20	3	28	2v 2g	12,000	....	+	+	+
21	3	27	2v 2g	10,000	....	−	+	+
22	3	27	2v 2g	9,000	....	−	−	−
23	2	28	2v 2g	21,500	....	+	+	+
24	3	28	2v 2w	15,000	....	−	−	−
25	2	27	2v 2w	22,000	....	−	−	−
26	2	26	2v 2w	20,000	....	−	+	+
27	4	23	2v 2w	14,000	....	−	+	+
28	3	24	2v 2w	18,500	....	+	+	+
29	4	27	2v 2w	18,500	....	+	+	+
30	2	27	2v 2w	24,500	....	−	−	−
31	3	28	2v 2w	18,000	....	−	+	+
Average	5	30	2v 2g	32,750	....	....	....	....
Per cent giving positive test	....	....	....	....	....	48	71	74

Results of examination of Kennebec River water at intake of Augusta waterworks—Cont'd.

FEBRUARY, 1904.[a]

Day.	Turbidity.	Color.	Odor.[a]	Bacteria per cubic centimeter.	Bacillus coli. In 0.01 c. c.	In 0.1 c. c.	In 1 c. c.	In 10 c. c.
	Parts per million.	*Parts per million.*						
1	4	21	2v 2w	17,500	....	+	+	+
2	8	22	2v 2w	24,500	....	—	—	—
3	5	22	2v 2w	29,000	....	—	—	—
4	6	18	2v 2w	25,500	....	+	+	+
5	4	21	2v 2w	28,500	....	—	—	—
6	4	22	2v 2w	28,000	....	—	—	—
7	4	22	2v 2w	20,000	....	—	—	—
10	4	22	2v 2w	20,500	....	—	+	+
17	7	22	2v 2w	19,000	....	—	—	+
22	4	26	2v 2w	21,000	....	+	+	+
23	2	26	2v 2w	23,000	....	+	+	+
24	2	22	2v 2w	29,000	....	....	....	....
25	6	27	2v 2w	21,500	....	—	—	—
26	3	23	2v 2w	24,000	....	—	—	—
27	5	28	2v 2w	25,000	....	—	—	—
28	5	25	2v 2w	30,000	....	+	+	+
Average	4	23	2v 2w	24,466	....	....	....	....
Per cent giving positive test	....	....	....	....	....	33	40	47

MARCH, 1904.

Day.	Turbidity.	Color.	Odor.	Bacteria per cubic centimeter.	Bacillus coli. In 0.01 c. c.	In 0.1 c. c.	In 1 c. c.	In 10 c. c.
1	3	20	2v 2w	24,500	....	—	—	—
2	2	27	2v 2w	20,500	....	—	+	+
3	10	22	2v 2w	20,000	....	+	+	+
4	....	....	....	26,000	....	—	—	—
5	....	....	....	22,000	....	....	—	—
6	3	29	3v 3w	20,500	....	—	—	—
7	8	27	2v 2w	20,000	....	+	+	+
8	4	22	2v 2w	([b])	....	—	+	+
9	15	25	2v 2w	([b])	....	+	+	+
10	15	25	2v 2w	([b])	....	+	+	+
11	15	27	2v 2w	([b])	....	—	—	—
12	12	25	2v 2w	20,000	....	+	+	+
13	12	25	2v 2w	([b])	....	—	—	—
14	15	27	2v 2w	24,000	....	+	+	+
15	12	31	2v 2w	21,500	....	—	—	—
16	12	32	2v 2w	19,500	....	—	—	—
17	8	35	2v 2w	8,000	....	+	+	+
18	10	31	2v 2w	22,000	....	+	+	+
Average	10	27	2v 2w	20,654	....	....	....	....
Per cent giving positive test	....	....	....	....	....	44	55	55

[a] The records during this month were interrupted by the illness of the collector.
[b] Plates liquefied.

Summary, by months, of results of examination of Kennebec River water above Waterville and at Augusta.

ABOVE WATERVILLE.

Month.	Number of samples.	Turbidity (parts per million).			Color (parts per million).			Bacteria per cubic centimeter (parts per million).			Average alkalinity (parts per million).
		Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.	
1903.											
February	2	......	......	......	......	......	......	2,750	3,500	3,125	......
March	4	60	60	60	50	50	50	605	4,400	2,284	8
April	4	10	18	13	28	45	38	240	660	500	9
May	2	5	6	6	36	38	37	640	1,100	870	7
June	6	5	48	17	56	108	83	1,500	15,000	6,300	10
July	1	......	......	20	......	......	40	......	......	110	......
August	7	2	10	4	36	58	44	145	600	315	14
September	6	2	7	4	38	42	39	185	900	252	13

AUGUSTA.

Month.	Number of samples.	Turbidity Minimum.	Turbidity Maximum.	Turbidity Average.	Color Minimum.	Color Maximum.	Color Average.	Bacteria Minimum.	Bacteria Maximum.	Bacteria Average.	Average alkalinity.
1903.											
August	7	2	5	3	29	45	36	225	475	313	14
September	30	2	5	3	32	45	36	230	830	451	15
October	30	2	8	5	27	34	30	290	1,040	532	13
November	25	4	12	7	29	33	31	175	860	624	15
December	31	3	30	12	15	40	32	1,180	37,450	7.927	17
1904.											
January	29	2	12	5	23	42	30	1,555	283,500	32,750	18
February	16	2	8	4	18	28	23	17,500	30,000	24,466	16
March	16	2	15	10	20	35	27	8,000	26,000	20,654	12
Summary of period Apr. 1, 1903, to Mar. 21, 1904		2	48	9	15	108	37	145	283,500	7,875	13

Results of examination of Messalonskee Stream at pumping station of Maine Water Company, Waterville.

FEBRUARY, 1903.

Day.	Turbidity (parts per million).	Color (parts per million).	Bacteria per cubic centimeter.	Bacillus coli.[a]		
				In 0.1 c. c.	In 1 c. c.	In 10 c. c.
2	......	......	370	......	+	+
3	......	......	200	......	+	+
4	3	28	230	......	......	......
5	......	......	265	......	+	+
6	13	28	360	......	+	+
9	......	......	375	+	+	+
10	......	......	278		+	+
11	......	......	248	......	+	+
12	......	......	1,370	+	+	+
13	......	......	2,800	−	+	+
14	......	......	1,100	+	+	+
16	......	......	655	+	+	+
17	......	......	500	−	−	+
18	......	......	385	+	+	+
19	......	......	430	−	−	+
20	......	......	260	−	+	+
21	......	......	770	+	+	+
23	1	28	330	−	−	+
24	1	29	440	+	+	+
25	0	28	350	−	+	+
26	2	28	370	−	+	+
27	4	30	590	+	+	+
28	12	34	[b]1,860	−	−	−
Average	5	29	632	......	......	......
Per cent giving positive test				50	82	95

[a] Plus sign indicates the presence and minus sign the absence of this organism.
[b] Average of seven observations.

Results of examination of Messalonskee Stream at pumping station of Maine Water Company, Waterville—Continued.

MARCH, 1903.

Day.	Turbidity (parts per million).	Color (parts per million).	Bacteria per cubic centimeter.	Bacillus coli. In 0.1 c. c.	Bacillus coli. In 1 c. c.	Bacillus coli. In 10 c. c.
1	40	28	28,000	−	−	−
2	8	32	10,000	−	−	−
3	5	32	3,900	+	+	+
4	3	30	1,365	+	+	+
6	4	30	620	−	+	+
7	5	28	720	−	−	−
9	45	28	11,050	−	+	+
10	8	28	7,300	−	−	−
11	75	26	25,500	−	−	−
12	10	28	3,700	−	+	+
13	6	30	1,700	−	+	+
14	3	32	875	−	−	−
16	2	32	1,150	+	+	+
17	2	30	1,000	+	+	+
18	4	32	950	−	−	−
19	5	34	590	−	−	+
20	3	28	770	−	−	−
21	3	34	950	+	+	+
23	4	32	950	−	+	+
24	15	34	1,150	+	+	+
25	2	32	745	−	−	+
26	2	30	420	−	+	+
27	4	30	435	−	+	+
28	3	30	400	−	+	+
30	2	28	240	−	+	+
31	45	40	3,100	−	+	+
Average	12	31	4,138			
Per cent giving positive test				23	62	69

APRIL, 1903.

Day.	Turbidity (parts per million).	Color (parts per million).	Bacteria per cubic centimeter.	Bacillus coli. In 0.1 c. c.	Bacillus coli. In 1 c. c.	Bacillus coli. In 10 c. c.
1	2	36	500	−	+	+
2	1	30	410	−	+	+
3	1	30	425	+	+	+
4	4	30	445	−	+	+
6	2	30	220	−	+	+
7	1	30	450	−	+	+
8	4	28	480	−	−	+
9	5	30	1,325	−	+	+
10	4	30	180	−	+	+
11	2	30	164	−	−	+
13	1	26	210	−	+	+
14	1	28	97	−	−	+
15	2	28	265	−	−	−
16	2	28	175	+	+	+
17	2	30	250	−	+	+
18	3	28	275	+	+	+
20	2	28	190	−	−	−
21	2	28	170	−	+	+
22	2	28	310	−	+	+
23	1	30	410	−	−	+
24	2	30	375	−	+	+
25	3	28	540	+	+	+
27	2	26	410	−	+	+
28	1	28	880	−	+	+
29	4	32	1,450	−	−	+
30	3	28	1,225	−	+	+
Average	2	29	455			
Per cent giving positive test				15	73	92

Results of examination of Messalonskee Stream at pumping station of Maine Water Company, Waterville—Continued.

MAY, 1903.

Day.	Turbidity (parts per million).	Color (parts per million).	Bacteria per cubic centimeter.	Bacillus coli. In 0.1 c. c.	Bacillus coli. In 1 c. c.	Bacillus coli. In 10 c. c.
1	22	32	1,425	+	+	+
2	2	28	3,100	−	+	+
4	2	28	1,150	−	+	+
5	4	30	2,900	−	−	+
6	6	28	4,150	−	+	+
7	4	30	2,000	−	+	+
8	2	30	2,650	−	−	+
9	15	30	2,800	−	+	+
11	10	30	1,300	−	+	+
12	8	30	1,350	−	+	+
13	2	30	2,200	+	+	+
14	2	30	925	−	+	+
15	2	28	940	−	+	+
16	5	30	1,200	−	−	−
18	2	30	550	−	−	+
20	8	32	1,000	+	+	+
21	2	24	[a]20,000	−	+	+
22	6	30	720	−	−	+
23	6	28	600	−	−	−
25	3	34	510	−	+	+
26	2	26	475	−	+	+
28	3	28	410	−	+	+
29	2	30	685	−	−	+
30	1	30	650	−	+	+
Average	5	29	2,237			
Per cent giving positive test				13	71	92

JUNE, 1903.

Day.	Turbidity (parts per million).	Color (parts per million).	Bacteria per cubic centimeter.	Bacillus coli. In 0.1 c. c.	Bacillus coli. In 1 c. c.	Bacillus coli. In 10 c. c.
1	2	32	[b]185	−	−	+
2	2	30	1,010	−	+	+
3	3	28	850	+	+	+
4	6	26	800	−	+	+
6	4	28	830	+	+	+
8	1	28	500	−	+	+
9	5	30	1,750	+	+	+
10	2	30	2,350	+	+	+
11	3	30	2,900	−	+	+
12	2	28	1,600	−	+	+
13	[c]39	[c]42	[c]15,050	+	+	+
14	26	60	41,400	+	+	+
15	8	64	5,500	+	+	+
16	3	36	3,500	−	+	+
17	2	34	2,700	+	+	+
18	2	34	970	−	+	+
19	2	30	1,250	+	+	+
20	2	26	810	+	+	+
22	1	26	290	−	−	+
23	4	30	1,250	−	+	+
24	2	28	960	+	+	+
25	2	30	360	+	+	+
26	2	30	410	+	+	+
27	3	34	290	−	+	+
29	5	26	....	−	−	+
30	3	30	170	−	−	+
Average	5	33	3,507			
Per cent giving positive test				50	85	100

[a] Considerable amount of trash from bridge building on Western avenue.
[b] Pump not running.
[c] Average of two observations.

Results of examination of Messalonskee Stream at pumping station of Maine Water Company, Waterville—Continued.

JULY, 1903.

Day.	Turbidity (parts per million).	Color (parts per million).	Bacteria per cubic centimeter.	Bacillus coli.		
				In 0.1 c. c.	In 1 c. c.	In 10 c. c.
1	3	30	360	−	+	+
2	5	26	510	−	+	+
3	6	26	500	−	+	+
6	6	28	....	+	+	+
7	3	26	290	+	+	+
8	2	26	310	−	+	+
9	10	28	345	−	+	+
10	6	28	270	+	+	+
11	8	28	320	−	+	+
13	2	28	230	−	+	+
14	2	28	350	+	+	+
15	3	28	580	−	−	−
16	1	28	800	+	+	+
17	3	28	650	−	−	+
20	2	26	280	−	+	+
21	7	28	1,850	+	+	+
22	10	28	3,850	+	+	+
23	3	28	2,750	+	+	+
24	60	60	28,500	+	+	+
25	7	28	3,200	−	+	+
27	4	28	450	−	+	+
28	8	28	1,450	−	+	+
29	4	28	1,600	+	+	+
30	2	30	950	+	+	+
31	3	26	925	−	+	+
Average	7	29	2,138	....	....	....
Per cent giving positive test	....	....	....	44	92	96

AUGUST, 1903.

Day.	Turbidity (parts per million).	Color (parts per million).	Bacteria per cubic centimeter.	Bacillus coli.		
				In 0.1 c. c.	In 1 c. c.	In 10 c. c.
3	5	26	60	−	−	−
4	4	28	775	+	+	+
5	3	26	2,500	+	+	+
6	4	28	600	+	+	+
7	6	26	760	+	+	+
8	5	26	700	−	−	+
9	7	28	210	−	−	+
11	3	28	605	−	−	−
12	4	28	650	+	+	+
13	3	28	1,000	+	+	+
15	2	30	1,300	−	+	+
18	....	....	22,500	−	−	+
19	3	26	2,450	+	+	+
20	2	28	1,300	−	+	+
21	4	26	4,000	−	−	+
22	3	26	2,000	−	−	+
24	2	26	220	+	+	+
26	3	26	350	+	+	+
27	2	26	790	−	+	+
28	2	26	3,050	+	+	+
29	2	26	500	+	−	+
31	2	26	150	−	+	+
Average	3	27	2,112	....	....	....
Per cent giving positive test	....	....	....	41	64	91

Results of examination of Messalonskee Stream at pumping station of Maine Water Company, Waterville—Continued.

SEPTEMBER, 1903.

Day.	Turbidity (parts per million).	Color (parts per million).	Bacteria per cubic centimeter.	Bacillus coli.		
				In 0.1 c. c.	In 1 c. c.	In 10 c. c.
1	2	26	325	−	+	+
3	2	26	555	−	−	+
4	2	24	685	−	+	+
5	1	24	....	−	−	+
7	1	....	130	+	+	+
8	2	26	130	+	+	+
9	2	26	300	+	+	+
10	1	26	470	+	+	+
11	3	24	415	−	+	+
12	....	....	200	−	−	−
14	1	24	175	−	+	+
16	....	....	400	−	+	+
17	....	....	355	+	+	+
22	....	....	360	+	+	+
26	....	....	385	−	−	−
30	....	....	250	−	−	+
Average	2	25	342	....	....	....
Per cent giving positive test	....	....	....	37	75	88

CHEMICAL CONSTITUENTS,

The water of Kennebec River at all points above the Augusta dam is soft. In fact, all of its chemical constituents are extremely low. This is to be expected from the general character of the basin, which contains no beds of limestone and few deposits of clay or minerals readily soluble in water.

The results of the chemical analyses of the Kennebec water at Waterville and Augusta are given in the tables on pages 182–183. These results show that at Waterville the total solids in the water seldom exceeded 50 parts per million. Of this amount about 20 parts per million represented hardness made up of carbonates and sulphates in nearly equal proportions. The alkalinity varied from 8 to 12 and the incrustants from 7 to 9 parts per million. The amount of iron was rather small.

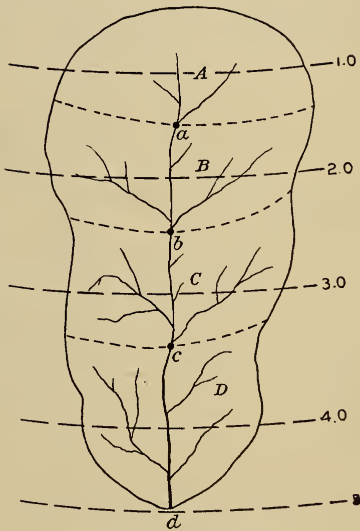


FIG. 11.—Diagram showing use of normal-chlorine isochlors.

Above the Edwards Company's dam at Augusta the amount of chlorine in the water is low at all points, but it is less at the upper end than in the lower reaches of the stream. This is chiefly because of the pollution of the river, which increases downstream, but it is also due to the fact that the normal chlorine of the drainage basin becomes greater as the seacoast is approached.

The studies of the normal distribution of chlorine in the waters of the State made by D. D. Jackson[a] show that the isochlor of 0.7 part per million passes through the geographic center of the Kennebec basin and that the normal chlorine varies from 0.4 part per million at the upper end of the stream to 6.0 parts per million at the mouth. Between these two points the normal chlorine gradually increases.

It must not be assumed, however, that the normal chlorine of the river at any particular point is the same as that shown by the isochlor which passes through that point. It is shown rather by the isochlor which passes through the geographic center of the basin above it. Thus the diagram shown in fig. 11 represents an imaginary drainage basin divided into portions of equivalent area (*A*, *B*, *C*, and *D*) and gives the isochlors. The figures which truly represent the normal chlorine of the river water at the points *a*, *b*, *c*, and *d* are not 1.5, 2.5, 3.5, and 4.5, as might at first be thought from an inspection of the isochlors, but at *a* the normal chlorine is 1.0, the result obtained by integrating all the normals for the subdivision *A* above it; at *c* the normal is 1.5, the result obtained by integrating the normals for the regions *A* and *B*; and so on, until at *d*, the mouth of the stream, the normal chlorine is found to be 2.5 parts per million instead of 5.0, as would be obtained if the reading were taken directly from the isochlor.

Chemical analyses of Kennebec River water above Waterville, January 19 to August 17, 1903.

[Parts per million, unless otherwise stated.]

Date of collection.	Turbidity.	Color.	Odor.[b]	Nitrogen as— Albuminoid ammonia. In solution.	In suspension.	Total.	Free ammonia.	Nitrites.	Nitrates.	Total solids.	Chlorine.	Total hardness.	Alkalinity.	Incrustants.	Iron.	Total microscopic organisms per cubic centimeter.	Amorphous matter per cubic centimeter.
January 19	2	37	2v.	0.092	0.004	0.096	0.002	0.000	0.05	46.0	0.8	31.0	12.0	19.0	0.15	44	300
March 12	60	50	3v.	.118	.096	.214	.018	.001	.05	66.0	.7	17.0	9.0	8.0	....	76	3,000
April 18	10	40	3v.	.104	.004	.108	.010	.001	.10	49.0	.6	17.0	8.0	9.0	....	112	800
May 23	5	36	3v.	.104	.022	.126	.016	.000	.00	43.0	.4	18.0	11.0	7.0	....	95	40
June 23	5	56	3v.	.142	.008	.150	.028	.000	.00	39.0	.6	19.0	9.0	10.0	....	235	60
August 17	3	38	3v. 2m.	.094	.028	.122	.012	.002	.00	48.0	.8	19.0	10.0	9.0	.20	170	65
Average	14	43	....	.109	.027	.136	.014	.001	.03	48.5	.7	20.2	9.8	10.3	....	121	711

[a] The normal distribution of chlorine in the natural waters of New York and New England: Water-Sup. and Irr. Paper No. 144, U. S. Geol. Survey, 1905.

[b] Scale for odor is given on p. 173.

Chemical analyses of Kennebec River water at the intake of Augusta waterworks, August 25, 1903, to February 17, 1904.

[Parts per million, unless otherwise stated.]

Date of collection.	Turbidity.	Color.	Odor.[a]	Nitrogen as—						Total solids.	Chlorine.	Total hardness.	Alkalinity.	Incrustants.	Iron.	No. of bacteria per cubic centimeter, 48 hours at 20° C.	Bacillus coli.				Total microscopic organisms per cubic centimeter.	Amorphous matter per cubic centimeter.
				Albuminoid ammonia.		Total.	Free ammonia.	Nitrites.	Nitrates.								In 0.01 c. c.	In 0.1 c. c.	In 1.0 c. c.	In 10.0 c. c.		
				In solution.	In suspension.																	
1903.																						
August 25	5	32	3v. 1w.	0. 088	0. 018	0. 106	0. 008	0. 001	0. 00	44. 0	0. 8	21. 0	13. 0	8. 0	0. 20	260	......	−	−	+	200	375
August 31	3	45	2v. 3w.	. 126	. 006	. 132	. 012	. 000	. 00	62. 0	. 8	17. 0	15. 0	2. 0	. 20	360	......	−	−	+	90	100
September 8	4	39	2v. 3w.	. 108	. 000	. 108	. 014	. 001	. 05	53. 0	. 9	18. 0	16. 0	2. 0	. 10	260	......	+	+	+	240	65
September 14	4	33	2v. 3w.	. 110	. 014	. 124	. 018	. 001	. 05	55. 0	. 6	17. 0	15. 0	2. 0	. 20	610	+	+	+	......	615	625
September 21	4	34	1v. 3w.	. 088	. 010	. 098	. 010	. 002	. 00	53. 0	. 6	15. 5	14. 0	1. 5	. 15	615	−	−	+	......	200	500
October 6	6	28	1v. 2w.	. 084	. 012	. 096	. 013	. 001	. 00	56. 0	. 7	16. 0	13. 0	3. 0	. 15	295	−	−	−	......	145	185
October 19	6	30	2v. 1w.	. 104	. 010	. 114	. 019	. 002	. 05	64. 0	. 8	14. 0	12. 0	2. 0	. 10	630	−	+	+	......	300	1,005
November 2	5	30	2v. 1w.	. 114	. 006	. 120	. 024	. 002	. 05	72. 0	1. 0	22. 0	14. 0	8. 0	. 20	725	−	−	−	......	140	415
November 16	8	32	2v. 1w.	. 112	. 004	. 116	. 030	. 002	. 00	62. 0	1. 3	20. 0	16. 0	4. 0	. 15	830	......	−	+	+	85	375
December 7	7	30	2v. 1w.	. 116	. 008	. 124	. 033	. 002	. 05	58. 0	1. 5	19. 0	16. 0	3. 0	. 15	3,330	......	−	+	+	70	210
December 21	10	28	2v. 1w.	. 098	. 010	. 108	. 038	. 001	. 05	60. 0	2. 2	21. 0	17. 0	4. 0	. 10	3,900	......	+	+	+	50	180
1904.																						
January 12	5	38	2v. 2w.	. 104	. 006	. 110	. 026	. 001	. 05	57. 0	1. 4	23. 0	18. 0	5. 0	. 10	38,000	......	−	−	−	85	120
January 26	2	26	2v. 2w.	. 112	. 014	. 126	. 014	. 000	. 10	54. 0	1. 3	23. 0	19. 0	4. 0	. 10	20,000	......	−	+	+	60	65
February 17	7	22	2v. 2w.	. 102	. 026	. 128	. 012	. 001	. 05	60. 0	1. 4	22. 0	16. 0	6. 0	. 15	19,000	......	−	−	+	635	170
Average	5. 3	32	2v. 2w.	. 105	. 010	. 115	. 019	. 001	. 04	57. 8	1. 06	19. 1	15. 3	3. 9	. 15	....	......	......	......	......	....	....

[a] Scale for odor is given on p. 173.

On this basis the following approximate figures have been obtained for the normal chlorine of the Kennebec River water at various points, and side by side with these is given the normal chlorine for the local water sources at the same points.

Normal chlorine in Kennebec River basin.

[Parts per million.]

Place.	Taken from nearest isochlor.	Calculated from isochlors over whole basin.
Solon	0.6	0.43
Skowhegan	.75	.46
Waterville	1.0	.52
Augusta	2.0	.63
Richmond	3.0	.70

The absence of mineral matter makes the Kennebec water excellent for use in boilers and in connection with paper making and many other industries where chemicals are used. The low alkalinity, however, is something of a disadvantage in purifying the water by the mechanical system of filtration, in which alum is employed as a coagulant, as it necessitates the occasional use of soda.

The suspended matter in the Kennebec water was largely organic, except after heavy rains, when, as already pointed out, it was composed chiefly of river silt. The amount of dissolved organic matter corresponds well with that usually found in waters of similar color.

No analyses of the water were made at points above all sources of pollution, but the analyses made at Waterville, above which the amount of pollution is comparatively small, represent a near approach to natural conditions. The free ammonia was very low, indicating that decomposition of organic matter was inactive; the amounts of nitrogen as nitrites and nitrates were also very small.

MICROSCOPIC ORGANISMS.

The numbers of microscopic organisms in the river water were found to be very small, although they were higher than in many other streams. These higher numbers may have been due to the fact that the basin contains so many lakes, in which these organisms find favorable conditions for development. The results of the microscopical examinations are given in the accompanying tables. The amorphous matter varied considerably at different times, as described under the heading "Turbidity" (p. 169). It consisted very largely of broken-down organic matter, in which vegetable filaments and fragments of wood fiber were conspicuous. This woody fibrous matter was much more abundant at Augusta than at Waterville, probably on account of the waste products from the Hollingsworth & Whitney paper mill at Winslow.

Microscopic organisms in samples of water from Kennebec River collected at Waterville, 1903.

[Standard units per cubic centimeter.]

Organism.	January 19.	March 12.	April 18.	May 23.	June 23.	August 17.
Synedra	16	10	.....	10	.....	.....
Asterionella	.....	.....	8	25	.....	.....
Tabellaria	.....	.....	15	15	40	.....
Diatoma	.....	.....	.....	5	.....	.....
Melosira	.....	15	.....	.....	50	.....
Cyclotella	.....	.....	.....	.....	.....	.....
Closterium	.....	5	5	25	40	10
Scenedesmus	.....	.....	.....	.....	10	.....
Cladothrix	28	12	15	.....	.....	.....
Anthophysa	.....	34	69	15	55	135
Actinophrys	.....	.....	.....	.....	.....	25
Mastigocerca	.....	.....	.....	.....	40	.....
Total organisms	44	76	112	95	235	170
Amorphous matter	300	3,000	800	40	60	65
Vegetable fiber	8	.....	.....	.....	.....	.....

Microscopic organisms in samples of water from Kennebec River collected at intake of Augusta waterworks, 1903–4.

[Standard units per cubic centimeter.]

Organism.	August, 1903.		September, 1903.			October, 1903.			
	25.	31.	8.	14.	21.	6.	13.	19.	26.
Diatomaceæ:									
Asterionella	5	.....	10	35	.....	.....	10	10	.....
Cyclotella	5	.....	.....	.....	.....	.....	.....	.....	10
Navicula	5	15	.....	.....	.....	.....	.....	.....	.....
Synedra	5	.....	15	225	5	.....	35	20	40
Tabellaria	10	15	.....	.....	.....	.....	.....	.....	.....
Melosira	.....	.....	15	20	20	25	40	.....	130
Stephanodiscus	.....	.....	.....	.....	.....	.....	.....	10	.....
Chlorophyceæ:									
Staurogenia	10	.....	.....	.....	.....	.....	15	.....	.....
Draparnaldia	40	.....	.....	.....	.....	.....	.....	.....	.....
Closterium	.....	.....	25	.....	.....	.....	.....	.....	.....
Dictyosphærium	.....	.....	40	.....	.....	.....	40	40	.....
Protococcus	.....	.....	20	.....	.....	.....	.....	.....	.....
Scenedesmus	.....	.....	.....	.....	10	.....	25	.....	.....
Cyanophyceæ:									
Microcystis	25	.....	65	25	.....	.....	.....	50	.....
Oscillaria	.....	25	.....	.....	25	.....	25	.....	.....
Cœlosphærium	.....	.....	.....	25	25	.....	.....	.....	.....
Clathrocystis	.....	.....	.....	.....	.....	40	.....	.....	.....
Fungi and schizomycetes:									
Crenothrix	40	35	.....	.....	.....	.....	.....	.....	.....
Leptothrix	.....	.....	50	165	55	70	105	110	10
Protozoa:									
Glenodinium	10	.....	.....	.....	.....	.....	.....	.....	.....
Dinobryon	25	.....	.....	25	.....	.....	.....	.....	.....
Paramæcium	20	.....	.....	.....	.....	.....	.....	.....	.....
Anthophysa	.....	.....	.....	95	25	.....	.....	20	.....
Chlamydomonas	.....	.....	.....	.....	10	.....	.....	.....	.....
Trachelomonas	.....	.....	.....	.....	.....	10	5	.....	.....
Synura	.....	.....	.....	.....	.....	.....	.....	40	.....
Rotifera:									
Anuræa	.....	.....	.....	.....	25	.....	.....	.....	.....
Total organisms [a]	200	90	240	615	200	145	300	300	240
Amorphous matter [b]	375	100	65	625	500	185	400	1,005	675
Vegetable and woody fiber	65	55	65	.....	60	.....	.....	.....	.....

[a] Average, 224. [b] Average, 346.

Microscopic organisms in samples of water from Kennebec River collected at intake of Augusta waterworks, 1903–4—Continued.

Organism.	November, 1903.			December, 1903.			January, 1904.		February, 1904.
	2.	9.	16.	1.	7.	21.	12.	26.	17.
Diatomaceæ:									
Asterionella	10		10	10		10	15	25	5
Navicula									10
Synedra	5	250	10		15		10	5	5
Tabellaria	10								
Melosira	10	20						5	
Meridion					5				
Cyanophyceæ:									
Microcystis		40							
Fungi and schizomycetes:									
Leptothrix	105	50	25	145	50	30	60		615
Protozoa:									
Anthophysa			40						
Actinophrys				40		10		25	
Cryptomonas								10	
Total organisms [a]	140	385	85	195	70	50	85	60	635
Amorphous matter [b]	415	500	375	270	210	180	120	65	170

[a] Average, 224. [b] Average, 346.

BACTERIA.

The number of bacteria in the water of Kennebec River at Waterville varied during the course of the observations from 110 to 15,000 per cubic centimeter. In general, the high figures were found at times of large stream flow. Not enough analyses were made to give a fair annual average.

No attempt was made to determine the prevailing species of bacteria in the water, but many presumptive tests were made to show the presence of *Bacillus coli*. Laboratory experiments at Waterville showed that under the local conditions this test gave a very fair indication of the actual presence of this organism, a result which is not everywhere obtained. Positive indications of the presence of *B. coli* were shown in 94 per cent of the 10 c. c. samples tested at Waterville, 81 per cent in the 1 c. c. samples, and 30 per cent in those of 0.1 c. c. The results of these observations are given in the tables on pages 172–177.

EFFECT OF TIDES ON QUALITY OF THE WATER BELOW AUGUSTA.

The lower part of Kennebec River may be considered a narrow tidal estuary, in which the tide ebbs and flows to the foot of the Edwards Company's dam at Augusta. Under ordinary conditions of stream flow the water is fresh nearly to the mouth of the river, but at times brackish water extends nearly to Augusta. Yet the public water supply of Richmond is obtained from the river.

Few analyses of the river water at points below Augusta have been made, but one series of analyses made at Richmond through a course of tides serves well to illustrate the variations which take place in the chlorine content of the water at different stages of the tide.

December 9, 1903, the flow of the river at Winslow was 1,351 second-feet, which is extremely low. Samples were collected at the surface and at the bottom of the river opposite the Richmond steamboat wharf and tested for chlorine. The elevation of the water surface was also read from the gage of the United States Coast and Geodetic Survey on the steamboat wharf. The results of these analyses are given in the subjoined table, and are also shown by fig. 12. From this diagram it will be seen that the chlorine in the water varied from 50

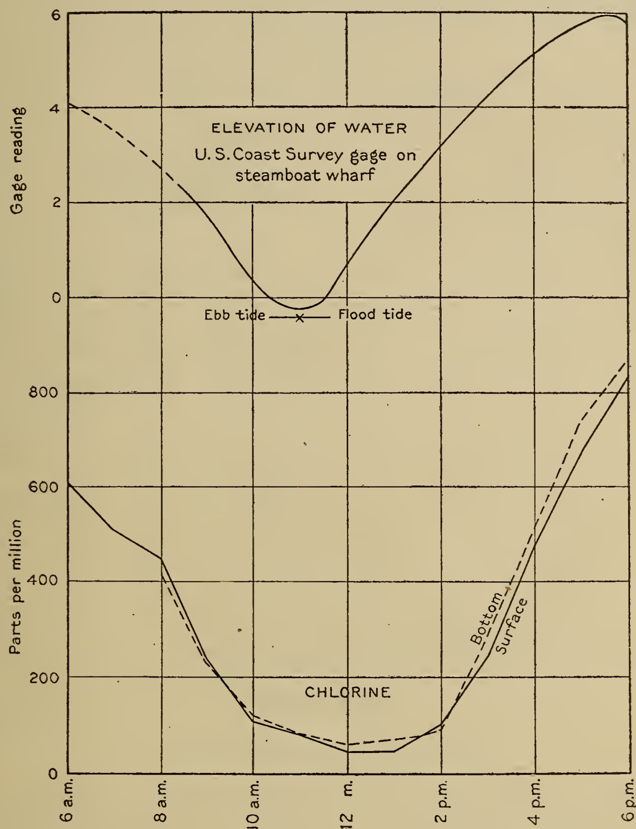


FIG. 12.—Fluctuations of chlorine in Kennebec River water at Richmond, December 9, 1903.

to 870 parts per million between low and high tide. As a water tastes brackish when the amount of chlorine exceeds 150 parts per million, it will be seen that the river water and consequently the public water supply of Richmond on the date mentioned was noticeably brackish for about two-thirds of the time. The diagram also shows that the time of minimum saltness occurred just after low tide, and the time of maximum saltness just after high tide. It is interesting to observe further that there was a conspicuous under run of sea water on the flood tide; thus when the tide was running in, the water at the bottom of the river was salter that at the surface. This is a phenomenon common to all tidal estuaries.

On February 5, 1904, two samples of water were collected from the river at 4.30 p. m., when the tide was running in. The surface water contained 136 parts of chlorine per million, and the water at the bottom contained 194 parts per million. To judge from the stream flow between December 9, 1903, and February 5, 1904, there is good reason to believe that throughout the winter the public water supply at Richmond was more or less brackish.

Chlorine in water of Kennebec River, elevation of water surface, and direction of current at Richmond, Me., December 9, 1903.

Hour.	Chlorine (parts per million).		Gage height (feet).[a]	Direction of current.
	Surface.	Bottom.		
6 a. m	610			Downstream.
7 a. m	510			Do.
8 a. m	450	420		Do.
8.30 a. m			2.15	Do.
9 a. m	240	230		Do.
9.30 a. m			1.15	Do.
10 a. m	110	120		Do.
10.30 a. m			—0.10	
11 a. m	80	80		No current.
11.30 a. m			—0.05	
12 m	50	60		
12.30 p. m			1.38	Upstream.
1 p. m	50	70		
1.30 p. m				Do.
2 p. m	100	95		
2.30 p. m			3.25	
3 p. m	250	280		Do.
3.30 p. m			4.70	
4 p. m	480	510		Do.
4.30 p. m			5.60	
5 p. m	670	740		Do.
5.30 p. m			5.90	
6 p. m	830	870		Do.
6.15 p. m			5.40	

[a] Read on gage of United States Coast and Geodetic Survey.

POLLUTION.

SOURCE AND CHARACTER.

The general pollution of the Kennebec River water at various points is usually measured by the density of population dwelling on the drainage area above those points, because either directly or indirectly the waste products of life and industry are washed into the river and carried to the ocean. Although this is true, the greatest effect on the quality of the water is produced by that part of the population which discharges sewage and manufacturing wastes directly into the river or its tributaries. This is more liable to be the case where the population is concentrated in villages and cities than where it is widely scattered, because compact settlements are more likely to be provided with sewers, which discharge, with or without purification, into some watercourse. The division of the total population into the classes "rural," "village," and "urban" furnishes a convenient and, on the whole, satisfactory basis for estimating its probable influence on the water. In the present discussion these classes are defined as follows: Rural, communities having fewer than 1,000 inhabitants; village, communities having between 1,000 and 4,000 inhabitants; urban, communities having more than 4,000 inhabitants.

On this basis the population per square mile has been determined for the drainage areas of the principal tributary streams of the Kennebec and at various points along the main stream. The results are shown in the following table and in fig. 13:

Drainage area and population of Kennebec basin at various points.

	Distance in miles.	Drainage area.	Population.				Population per square mile.			
			Rural.[a]	Village.[b]	Urban.[c]	Total.	Rural.[a]	Village.[b]	Urban.[c]	Total.
		Sq. m.								
Moosehead Lake, at outlet	0	1,240	1,730	0	0	1,730	1.6	0	0	1.6
Between Moosehead Lake and Dead River		330	210	0	0	210	0.6	0	0	0.6
Total above Dead River		1,570	1,940	0	0	1,940	1.2	0	0	1.2
Dead River	24	870	1,130	0	0	1,130	1.3	0	0	1.3
Between Dead River and Carrabassett River		350	250	0	0	250	0.7	0	0	0.7
Total above Carrabassett River		2,790	3,320	0	0	3,320	1.2	0	0	1.2
Carrabassett River	60	395	3,370	0	0	3,370	9.0	0	0	9.0
Between Carrabassett River and Sandy River		35	610	1,380	0	1,990	18.0	39.0	0	57.0
Total above Sandy River		3,220	7,300	1,380	0	8,680	2.2	0.4	0	2.7
Sandy River	68	670	6,820	6,330	0	13,150	10.0	9.0	0	19.0
Between Sandy River and Waterville		380	3,520	6,760	5,180	15,460	9.0	18.0	14.0	40.0
Total above Waterville	98	4,270	17,640	14,470	5,180	37,290	4.0	3.8	1.2	8.7
Messalonskee Stream	99	210	2,450	2,940	0	5,390	12.0	14.0	0	26.0
Sebasticook River		970	11,580	13,760	0	25,340	12.0	14.0	0	26.0
Between Waterville and Augusta[d]		130	950	2,060	10,480	13,490	7.3	16.0	80.0	103.0
Total above Augusta	116	5,580	32,620	33,230	15,660	81,510	5.8	5.9	2.8	14.4
Cobbosseecontee Stream	122	240	5,470	3,070	0	8,540	22.0	12.0	0	36.0
Between Augusta and Merrymeeting Bay[e]		150	1,840	7,940	10,690	20,470	12.0	53.0	71.0	136.0
Total above mouth of Kennebec River	141	5,970	39,930	44,240	26,350	110,520	6.7	7.5	4.4	18.5

[a] Communities with less than 1,000 inhabitants.
[b] Communities with 1,000 to 4,000 inhabitants.
[c] Communities with more than 4,000 inhabitants.
[d] Omitting the Messalonskee and Sebasticook.
[e] Omitting the Cobbosseecontee.

For the first 60 miles of its course the river is practically unpolluted. There are no cities or important villages, the population being mainly in lumber camps and a few settlements of summer visitors. The rural population per square mile is very low. Along the middle course of the river there are numerous villages, and lower down are the cities of Skowhegan, Waterville, Augusta, and Gardiner. In all there are on the Kennebec drainage area 115 cities, towns, and villages, with population as follows:

Population in towns in Kennebec basin.

Population.	Number of communities
0-1,000	86
1,000-2,000	16
2,000-5,000	9
5,000-10,000	2
10,000-20,000	2
	115

The distribution of these communities over the drainage area is shown in fig. 14.

The greatest amount of pollution is contributed by the cities and

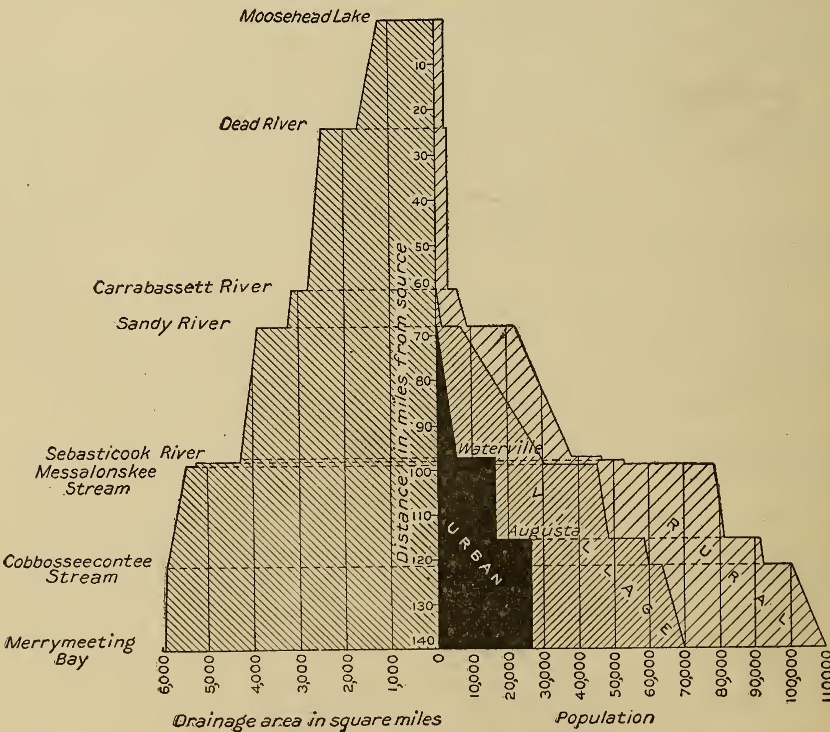


FIG. 13.—Diagram showing drainage area and population above various points on Kennebec River.

towns located directly on the river and its main tributaries. These cities are Madison, Skowhegan, Pittsfield, Newport, Waterville, Augusta, Gardiner, and Richmond, and all of them discharge sewage directly into the stream. At the Augusta waterworks hearing it was estimated that about 13,000 people discharged sewage into the river above the intake. The ordinary dry-weather flow of the stream at this point was considered as 0.25 second-foot for each 1,000

FIG. 14.—Map showing principal sources of pollution in Kennebec River basin and normal isochlors.

persons contributing sewage. This represents a substantial dilution of sewage—enough to prevent visible nuisance. It does not, however, render the water safe for drinking.

Sewage and manufacturing wastes discharged into Kennebec and Sebasticook rivers above Augusta.

Sources of pollution.	Distance above Augusta intake.	Persons using public sewers.	Persons in mills.	Persons using privies or private sewers.	Manufacturing wastes discharged daily. Woolen mills. Spent dye.	Woolen mills. Preparatory liquor.	Woolen mills. Soap.	Woolen mills. Wash water.	Paper and pulp mills. Groundwood wash.	Paper and pulp mills. Sulphite wash.	Paper and pulp mills. Paper machine.	Paper and pulp mills. Spent sulphite liquor.
	Miles.				*Gallons.*	*Gallons.*	*Pounds.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*
Waterville	17.1	3,372										
Lockwood Manufacturing Co			1,300									
Riverview Worsted Co			250		10,000		600	30,000				
Waterville Iron Works				30								
Colby College				88								
Maine Central R. R. roundhouse			100									
Maine Central R. R. car shops			295									
Chase Manufacturing Co			65		750		30					
A. P. Emery [a]												
Hayden Brook				36								
Winslow	17.1											
Hollingsworth & Whitney Co			650						3,000,000	2,000,000	250,000	140,000
Fairfield	20.6											
Fairfield Furniture Co			35									
Gristmill			4									
Electric power station			5									
United Box Board and Paper Co			13									
American Woolen Co			175		5,000	5,000	80					
Shawmut	23.8											
United Box Board and Paper Co			80									
Lawrence Newhall & Page Co			240						200,000			
Skowhegan	34	1,516		140								
American Woolen Co			175		10,000	10,000	340	30,000				
Marston Worsted Co			275		6,000		75	40,000				
Commonwealth Shoe and Leather Co			250									
Bowdoin Pulp Co			10									
Skowhegan Pulp Co			25						50,000			
Electric Light Co			5									
Currier Brook				39								
Madison	46	636										
Madison Woolen Co			200		7,000		300					
Indian Spring Woolen Co			200		5,000	5,000	150					
Great Northern Paper Co										1,500,000	1,500,000	120,000
North Vassalboro	21.4											
American Woolen Co			300		6,000	2,000	500					
Benton Falls	21.8											
United Box Board and Paper Co			100									
Pittsfield	41	1,500										
Pittsfield Electric Light and Power Co			46									

R. Dobson & Co.	....	....	300	....	1,500	1,500	....	....	....	....	....	....
Waverley Woolen Co.	....	....	175	....	4,500	7,000	250	....	....	....	....	....
Riverside Woolen Co.	....	....	110	....	600	....	125	....	....	....	....	....
Newport	44.5	442	....	4	....	....	....	....	....	....	....	....
Newport Woolen Co.	....	....	150	....	5,000	5,000	250	....	....	....	....	....
Weymouth Wool Co.[b]	....	....	45	....	....	....	....	....	....	....	....	....
Borden Condensed Milk Co.	....	....	30	....	....	....	....	....	....	....	....	....
	....	7,466	5,608	337	61,350	35,500	2,700	100,000	3,250,000	3,500,000	1,750,000	260,000

[a] Pulls 300 sheepskins per week for 12 weeks.

[b] Pulls 1,250 sheepskins per day.

The manufacturing wastes emptied into the stream at various places are a more important factor in the general pollution of the stream than are the city sewers, if the use of the water for drinking purposes is disregarded. Woolen mills, paper mills, and various other industries are located at the developed water powers and many of them contribute large quantities of spent liquors of a highly objectionable character. Some idea as to the quantity of these discharged wastes may be had from the accompanying table, which, however, includes only those above the waterworks intake at Augusta and only those located in the largest cities and towns. These manufacturing wastes form about 1 per cent of the flow of the stream at low stages.

The two most important sources of pollution are the paper mills of the Great Northern Paper Company at Madison and those of the Hollingsworth & Whitney Company at Winslow, both of which discharge several million gallons a day of wash water and spent liquors. At Madison the sulphite process is used; the Winslow mills use both the sulphite and the ground-pulp processes.

In the sulphite process the disintegration of the wood fiber is accomplished by the use of the acid sulphites of calcium and magnesium, which are manufactured by burning sulphur and carrying the fumes into an "acid tower," packed with crushed lime or limestone, water being allowed to trickle down as the fumes ascend. The bisulphite solution runs out at the bottom of the tower and is pumped to the digesters, where the chipped wood to be treated is closely packed. Digestion under high pressure is continued for several hours, and the contents are then delivered into a pit, from which the waste liquor drains away to the river, leaving the fiber behind. This waste liquor has the appearance of molasses, but is much thinner. It has a sulphurous, acrid, woody odor. It generally contains from 0.5 to 1 per cent of sulphurous acid and often contains 10 to 15 per cent of solid matter, a part of which is fine wood fiber. The chemical constituents of the soluble portion of this spent sulphite liquor are extremely complex and are not well known. No attempt has been made to utilize the liquor or to purify it before letting it run into the river. After it has drained away, the sulphite pulp is carried to washers, when it is washed and sifted and ultimately worked into a "blanket," in which condition it is ready for paper making. The washings from this pulp contain considerable amounts of wood fiber and of course some of the sulphite liquor. The wash water after screening is allowed to run into the river. At Madison between 5 and 6 tons of sulphur are burned a day and at Winslow about 8 tons; the amounts of lime are about 7 or 8 tons a day at each place. Each plant discharges from 100,000 to 150,000 gallons a day of spent sulphite liquor and from 1,500,000 to 2,000,000 gallons of sulphite wash water. At the Hollingsworth &

Whitney plant there is in addition about 3,000,000 gallons a day of ground-wood wash.

Ground-wood pulp is made by pressing short lengths of logs against a rough stone grinder kept wet with water. The pulp thus produced is merely washed and screened and deposited as blankets. The wash water contains a large amount of wood fiber and extractive matter, but, on the whole, it is much less objectionable than the sulphite wash. In addition to the wash water from the pulp manufacture there is a considerable quantity of wash water from the paper machines; this also contains more or less wood fiber. Altogether, about ten per cent of the wood pulp manufactured may be considered as passing off into the stream as waste.

At Fairfield the soda process is used. In this process the wood is cut into chips and digested in a liquor, which consists chiefly of caustic soda made by cooking soda ash with limestone. The spent liquor from this process is subjected to a recovery treatment, which consists of evaporating the liquor in digesters and adding lime. As a result of this treatment much of the soda can be used over again; the waste produced is chiefly calcium carbonate. During the process, however, about 12 per cent of the soda is lost. The pulp from the digesters is washed, drained, and worked into the usual blanket form.

At the cotton mills there is comparatively little waste of an objectionable character, although small amounts of the spent bleach liquor are added to the stream. At the gas works more or less tar and oily wastes are discharged. At the woolen mills the waste products are rather objectionable. They consist of the spent preparatory liquor, which contains bichromate of potash, lactic acid, spent dyestuffs, such as logwood and various aniline dyes, and large quantities of potash soap. There are in Waterville a few ironworks which discharge acid wastes.

Log driving on Kennebec River deserves important mention in connection with the subject of pollution. In 1903 the logs driven on the river amounted to nearly 150,000,000 feet B. M. They consist chiefly of spruce, poplar, and pine, cut on the drainage basins of Moosehead Lake and Dead River. The run usually lasts from April to July, and during this time from 100 to 500 men are constantly employed along the stream.

EFFECTS OF POLLUTION.

The effect of pollution of the river at Waterville on the quality of the water as used at Augusta was studied with some care in connection with the appraisal of the Augusta waterworks. It was a common belief among the water consumers in Augusta that they could taste in the city water the paper-mill waste supposed to be put into the river by the mills at Waterville. As there were various sources of pollution at Waterville, no attempt was made to discriminate between them so far as they affected the water at Augusta, but some experiments and calculations were made to show the relative importance of the Waterville sewage and the wastes from the Hollingsworth & Whitney Company's plant.

It will be convenient to consider the effect of some of these sources of pollution on the various characteristics of the water.

EFFECT ON TURBIDITY.

That the paper-mill discharges at Waterville and at other points on the river influence the turbidity of the water at Augusta was very evident from the microscopic examinations of the sediments in the samples collected at the Edwards Company's dam. These were found to contain an abundance of woody fiber, which evidently came from the fine pulp that had escaped through the screens at the paper mills. Fibers of linen and wool were also discerned, but in much smaller numbers. When it is considered that about 10 per cent of the wood fiber is wasted in the process of paper making, it will readily be understood that the quantity of waste material put into the river is very great. Much of this fiber forms deposits in the bottom of the stream and on twigs, waterweeds, etc., along the shore, and these may be seen by an inspection of the river. At times of high water, however, the deposits are washea away and carried downstream to settle again at some lower point, but ultimately to reach the ocean.

EFFECT ON COLOR.

The effect of the sulphite waste on the color of the river water is probably small. A sample of it taken at the Hollingsworth & Whitney Company's plant had a color of 320. At times of average flow this would be diluted by about 272 parts of water. Therefore, under average conditions, the sulphite wash would increase the color of the water by less than 2 on the platinum scale. Under the most severe conditions of minimum flow, however, when the dilution would be only 1 in 20, this effect on the color would be very noticeable. At such times, however, the works are often shut down on account of lack of power, so that these extreme conditions of pollution would seldom prevail.

EFFECT ON ODOR.

That the people of Augusta were correct in thinking that the sulphite wastes from the Hollingsworth & Whitney paper mills at Winslow affected the taste of their water supply was demonstrated by experiments made in the State hygienic laboratory at Augusta. A sample of sulphite waste liquor was diluted with distilled water to various degrees to ascertain at what dilution the odor of the waste became unnoticeable. The original liquor had a strong odor suggestive of wood and sulphurous acid. Its color was 320; its acidity 1,500 parts per million. This odor was still marked when the sample was diluted 1 to 500, and it could be detected until the dilution reached 1 to 25,000, which was placed as the limit. A sample of wash water from the grinder lost its woody odor when diluted 1 to 500.

The effect of the discharge of sewage in Waterville on the odor of the river water could be detected for several miles down the stream, but after a time the odor became masked by the stronger odor due to the sulphite wastes.

EFFECT ON CHEMICAL CONSTITUENTS.

The effect of the stream pollution on the chemical quality of the river water between Augusta and Waterville is noticeable in the analyses, although not conspicuously large. The average amount of chlorine increased from 0.7 to 1.06 parts per million; the alkalinity increased from about 10.0 to 15.0 parts. Comparatively few chemical analyses were made of samples collected up and down the river on the same date, so that strict comparisons of the effect of pollution are not available.

EFFECT ON BACTERIA.

One effect of the discharge of sewage at Waterville was to increase considerably the numbers of bacteria in the water. This was clearly shown by numerous samples collected up and down the river between Waterville and Augusta. Two series of bacterial counts, made at intervals of 1 mile between Waterville and Augusta on November 23, 1903, and February 26, 1904, were especially interesting. The first series was taken when the river was open; the second when the surface was covered with ice. The results obtained are shown in the following table:

Bacteria per cubic centimeter in the water of Kennebec River at various points between Waterville and Augusta before and after the river was frozen.

Distance below Waterville sewer.	November 23–24, 1903 (river open).	February 26–27, 1904 (river closed).	Distance below Waterville sewer.	November 23–24, 1903 (river open).	February 26–27, 1904 (river closed).
Miles.			*Miles.*		
Just below	30,000	22,000	9	1,475	25,000
1	2,300	20,000	10	1,645	30,500
2	4,200	36,000	11	1,245	20,000
3	3,650	40,000	12	1,130	31,000
4	2,520	43,000	13	1,200	31,000
5	2,040	28,000	14	910	32,000
6	1,830	30,500	15	1,025	38,000
7	1,650	29,000	16	875	34,000
8	1,420	19,500	[a]17	860	25,000

[a] Augusta intake.

In November, the river being open, the number of bacteria gradually decreased from 30,000 per cubic centimeter immediately below the outlet of the Waterville sewer to 860 at the intake of the Augusta waterworks. In February, on the contrary, the number of bacteria remained substantially the same throughout the district, being 22,000 per cubic centimeter at a point just below the Waterville sewer and 25,000 at the Augusta intake. From the standpoint of the self-purification of streams these figures offer an interesting comparison and may help to throw some light on the fact, often noticed, that stream pollution appears to be most dangerous to water supplies during the winter months. The summary of analyses given in the table on p. 177 shows that with the freezing over of the river there was a rapid deterioration in the bacterial condition of the Augusta water supply. The approximate average numbers of bacteria per cubic centimeter during the different months from August, 1903, to March, 1904, were as follows:

Average number of bacteria per cubic centimeter in water of Kennebec River, August, 1903, to March, 1904.

August	300
September	450
October	525
November	625
December	7, 900
January	33, 000
February	25, 000
March	21, 000

The effect of the Waterville sewage on the quality of the river water was also convincingly shown by the presence of large numbers of *Bacillus coli* in the water at Augusta. During the eight months from August, 1903, to March, 1904, 72 per cent of the samples tested with 10 c. c. of water gave positive tests for *Bacillus coli*, 62 per cent with 1 c. c., and 36 per cent with 0.1 c. c.

Evidence more convincing even than these figures that the water of Kennebec River below Waterville is unfit for domestic use without purification is furnished by the typhoid-fever statistics for Augusta, which are given below.

TYPHOID FEVER EPIDEMIC OF 1902-3.

INTRODUCTION.

That the contamination of Messalonskee and Kennebec rivers was the direct cause of the typhoid-fever epidemics which occurred in Waterville and Augusta during the winter of 1902–3 seems to have been established beyond question. The following account of these epidemics is quoted from a paper presented to the New England

Waterworks Association in February, 1905, by George C. Whipple and Dr. E. C. Levy:[a]

The recent appraisals of the waterworks of Waterville and Augusta, Me., necessitated a careful study of the typhoid-fever epidemic which swept through the Kennebec Valley during the winter and spring of 1902–3. At the time when this epidemic occurred the plan of municipal ownership through the agency of "water districts" had been suggested and the law had been pronounced constitutional by the courts. The bad quality of the water supplied to these communities had much to do with this demand for public ownership, and the outbreaks of typhoid fever naturally hastened the actions which had been contemplated. The epidemic itself presented no novel features and its history is much the same as that of many other epidemics of typhoid fever due to public water supplies. Its magnitude, however, makes it deserve a place among the important epidemics of the country. * * *

The city of Waterville and the neighboring towns of Fairfield, Winslow, and Benton were, at the time of the epidemic, supplied by the Maine Water Company with water from the Messalonskee Stream. This stream has a watershed of 205 square miles above the pumping station and drains a chain of seven large lakes which have a combined water surface of 27.5 square miles. Upon this watershed there dwells a population of something over 5,000 persons, or about 27 per square mile. The upper portions of the watershed are comparatively unpolluted, but at the outlet of Messalonskee Lake is the town of Oakland, which has a population of approximately 2,000. At this place, which is only 7 miles above the pumping station of the Maine Water Company at Waterville, sewage is discharged from several private sewers. Along the stream are a number of mills, the most important of which are the Oakland and Cascade woolen mills, the mills of the Dunn Edge Tool Company and the Emerson & Stevens Company. They contribute not only a considerable amount of fecal matter, but wool washings, dyestuffs, and other kinds of manufacturing wastes. The Messalonskee River between Oakland and Waterville flows rapidly during the first half of its course and then somewhat more slowly as it feels the effect of the backwater of the waterworks dam. The time required for the water to flow from Oakland to Waterville is often only a few hours. The Maine Water Company had also the right to use the water of the Kennebec River. This water has been seldom used, although just prior to the epidemic it was pumped into the city for a short time because of a fire which occurred at Colby University. During the dry spell of last autumn (1904) it was again used, as the flow of the Messalonskee became insufficient to operate the pumps.

As might be naturally expected from the surroundings, the water at the pumping station of the Maine Water Company showed decided indications of pollution. Under ordinary conditions the water was light colored and fairly clear, but after rains it became turbid and heavily laden with bacteria. At all times the intestinal germ, *Bacillus coli*, was present in large numbers.

Prior to 1901 the typhoid-fever death rate in Waterville had not been especially high. During 1901 and 1902, however, the rate increased to more than 80 per 100,000, but it was not until the autumn of 1902 that the typhoid situation became serious.

The city of Waterville is fairly well provided with sewers, and at Waterville, Winslow, and Fairfield there are a number of mills which have privies directly over the stream.

About 18 miles below Waterville is the city of Augusta, the capital of the State. Augusta takes its water supply directly from the Kennebec River at a point just above the city, near the Kennebec dam. Until recently the works were owned by the Augusta Water Company. The river water was pumped to a reservoir, but was first passed through an old Warren filter, one of the first of its kind in America. This was a filter only in name and should have been more properly called a strainer. Analyses

[a] Jour. New England Waterworks Assoc., vol. 19, No. 2.

indicated that its bacterial efficiency was practically nil. As would be naturally expected, the river water at Augusta was found to be polluted. This was shown by the analyses which were made daily for several months, but it was even more strongly demonstrated by the typhoid-fever statistics of the city.

The water of the Kennebec River just below Waterville showed at all times evidences of gross pollution. During its flow of 17 miles to Augusta its bacterial quality appeared to improve somewhat. In the summer this improvement was much more noticeable than during the winter, when the river was covered with ice. Float experiments which were made indicated that the time required for water to flow from one place to the other was about three days at times when the discharge of the stream was small. At times of flood this period is probably not much, if any, more than twenty-four hours.

The Augusta Water Company also controlled and used a spring water supply known as the Devine water. In some houses this was used exclusively; in others both this and the river water was used. The quality of this water was poor, but better than that of the river.

The sewers of Augusta discharge into the river and there are several mills along the shore which pollute the water.

The town of Richmond, 15 miles below Augusta, also takes its water supply from the Kennebec River. The conditions there are such that the main current of the stream flows to the east of Swan Island, while the intake of the waterworks is located in the west channel. The river at Richmond is considerably affected by the tides; in fact, the town water is at times brackish. Thus, while the town uses the water which receives the sewage of Augusta, Waterville, and other cities, the tidal conditions tend somewhat to lessen the effect of this upstream pollution, although they increase the danger from local sources.

GENERAL ACCOUNT OF THE TYPHOID-FEVER EPIDEMIC.

The typhoid-fever epidemic of 1902–3 began about the middle of November, 1902. It was first noticed at Waterville, where for about a month new cases were reported at the rate of one a day. On Christmas day there were five new cases and during the next week the daily number of cases was the same. Thirteen were reported on New Year's day. After the middle of January the number of new cases fell off, but they continued to be reported at intervals until March. In Fairfield, Winslow, and Benton typhoid fever occurred at the same time. The largest number of cases was reported during the first two weeks of January. These four communities had the same water supply, namely, that of the Messalonskee River, and from the first it was evident that this was the cause of the epidemic.

As the sewage of these typhoid-fever stricken communities emptied into the Kennebec River and as the water of this river furnished the supply of Augusta, it was almost inevitable that the epidemic should extend to that city also, and this is what actually occurred. During the latter part of November and the whole of December new cases of typhoid fever occurred daily in Augusta. It seems probable that these earlier cases were due to the same source of infection that caused the epidemic at Waterville, inasmuch as the Messalonskee River, which supplied that city, discharges into the Kennebec above Augusta. It was not until about two weeks after the climax of the Waterville epidemic that the serious period of the Augusta epidemic began. During the latter part of December and throughout the months of January and February the sewage at Waterville must have been infected with typhoid-fever bacilli; and, making due allowances for the periods of sickness, transmission, and incubation, this time corresponded with the duration of the epidemic at Augusta. After the Waterville epidemic had ceased and sufficient time had elapsed for the patients to recover the epidemic at Augusta came to an end.

At Richmond, which is only a small village, typhoid fever did not occur until the middle of January, but occasional cases appeared during the next two or three months and were plainly connected with the epidemic of the cities above.

The city of Gardiner is situated between Augusta and Richmond. It does not take its water supply from the Kennebec River, but from the Cobbosseecontee River. This city had no epidemic, although a number of cases of typhoid fever occurred there. Most of these were contracted at Augusta. The same was true also of the town of Hallowell.

Fig. 15 shows chronologically the progress of this epidemic, together with certain factors which affected it. It indicates that the epidemics in the different communities formed a connecting series and may be really considered as one epidemic, inasmuch as they started from a common cause. In all there were about 612 cases and 53 deaths. * * *

TYPHOID FEVER IN WATERVILLE.

GENERAL ACCOUNT.

In studying the Waterville epidemic the first step taken was to secure with as much accuracy as possible certain information in regard to each case of typhoid fever. Printed forms were first distributed among the physicians, who were requested to fill them out and furnish any other important facts known to them in regard to each case of typhoid fever which they had attended. * * *

While waiting for the return of these blanks from the physicians, the records of the local board of health were consulted. As fast as the returns were received from the physicians, each house where a case of typhoid fever had occurred was visited by an inspector, who examined the surroundings, checked up the data recorded upon the blanks, and obtained as many additional data as possible. He also secured the name of the person furnishing the information, in case it became necessary to call witnesses in court, and finally signed the completed record. Duplicate copies of the blanks were made with carbon paper and one of each placed in a safe to guard against possible loss. The results were then tabulated for study and in some instances expressed graphically.

Data were also collected regarding the previous history of typhoid fever in the city. Similar data were obtained from Fairfield, Winslow, and Benton.

Cases of typhoid fever in Waterville, Fairfield, Winslow, and Benton, January 1, 1902, to August 1, 1903.

Month.	Waterville.	Fairfield.	Winslow.	Benton.	Total.
1902.					
January	2				2
February	1	1			2
March	4				4
April	3				3
May	3				3
June	4		1		5
July	13	1	1		15
August	12	1	2	1	16
September	10	1	1		12
October	7	3	1		11
November	20	5	2		27
December	64	6	14	1	85
1903.					
January	89	25	10	1	125
February	23	8	7		38
March	11	3			14
April	5	1	1		7
May		1	1		2
Total	271	56	41	3	371

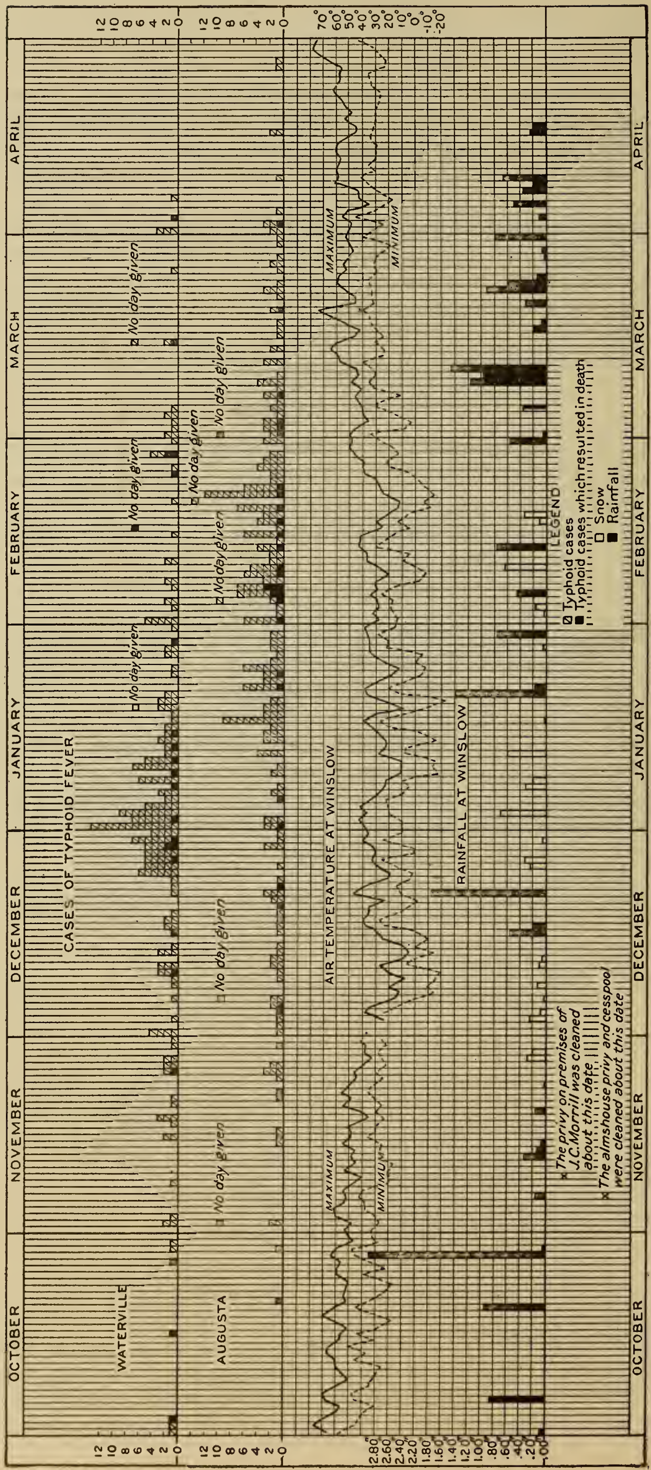


FIG. 15.—Diagram showing chronological distribution of typhoid-fever cases in Waterville and Augusta from October, 1902, to April, 1903.

The first typhoid canvass was followed by a complete house-to-house canvass throughout the four places above mentioned, primarily in order to secure data in regard to the water used, but also to obtain information as to the distribution of typhoid fever among users of different classes of waters. This not only accomplished its immediate object, but brought to light a number of additional cases of typhoid fever which the physicians had failed to report, some of which might be classed as "walking cases." No case, however, was included in the final compilation until it had the indorsement of the attending physician.

Results of a house-to-house canvass in Waterville, Me., with reference to the character of the water supplies and the number of cases of typhoid fever.

Water supply at residence.	Number of persons.	Number of typhoid cases.	Morbidity rate per 1,000.
Maine Water Co.	6,537	226	34.57
Maine Water Co. and no other supply	3,225	132	40.93
Maine Water Co. and well water	866	23	26.57
Maine Water Co. and spring water	2,424	71	29.29
Maine Water Co. and cistern water	2	0	0.00
Maine Water Co., spring water, and well water	20	0	0.00
Maine Water Co. and well, spring, or cistern water	3,312	94	28.38
Supplies other than Maine Water Co.	1,459	21	14.41
Well water only	1,286	19	14.77
Well water and spring water	25	1	40.00
Well water and cistern water	13	0	0.00
Spring water only	108	1	9.26
Spring water and cistern water	23	0	0.00
Cistern water only	4	0	0.00
Total	7,996	247	30.89

Summary of a house-to-house canvass in the Kennebec water district with reference to the character of the water supplies and the number of cases of typhoid fever.

	Supply from Maine Water Co.			No supply from Maine Water Co.			Total.		
	Number of persons.	Number of typhoid cases.	Morbidity rate per 1,000.	Number of persons.	Number of typhoid cases.	Morbidity rate per 1,000.	Number of persons.	Number of typhoid cases.	Morbidity rate per 1,000.
Waterville	6,537	226	34.57	1,459	21	14.41	7,996	247	30.89
Fairfield	1,614	54	33.45	468	2	4.25	2,082	56	26.89
Winslow	244	11	45.08	902 [a] 470	19 [a] 4	21.06 [a] 8.29	1,146	30	26.18
Benton	152	2	13.15	125	1	8.00	277	3	10.83
Total	8,547	293	34.28	2,954	43	14.55 [a] 8.74	11,501	336	29.21

[a] Omitting users of Kennebec River water.

It is not necessary to relate in detail all the steps that were taken. Studying the etiology of the epidemic by the method of elimination, all possible causes other than the public water supply were readily excluded. It could not have been caused by flies, because at the season of the year when the epidemic started there were no flies. Ice was excluded, because during the winter practically no ice was being used. Oysters were eliminated, because very few of them were consumed in the city, and because a very large part of the epidemic occurred among the French-Canadian laboring people, who seldom purchased them. Furthermore, the extended territory covered by the epidemic was in itself sufficient to exclude the above agencies. Milk was excluded as a general cause, because the data collected indicated that the cases of typhoid fever were not concentrated among the customers of one or a few milkmen, but were well distributed among the dealers. The distribution was found to be roughly proportional to the size of the business and the number of cows kept. It was a singular fact that there was no case of typhoid fever among the customers of J. W. Morrill, in whose family one of the initial cases of the epidemic occurred.

Vended spring waters were excluded, because the users of this class of water suffered far less than others, because the spring waters gave excellent analyses, and because the water from no single spring or group of springs was used over the entire territory affected. The local wells were studied by us to some extent and quite extensively by Mr. Caird. Many were found to be polluted, as would be naturally expected from

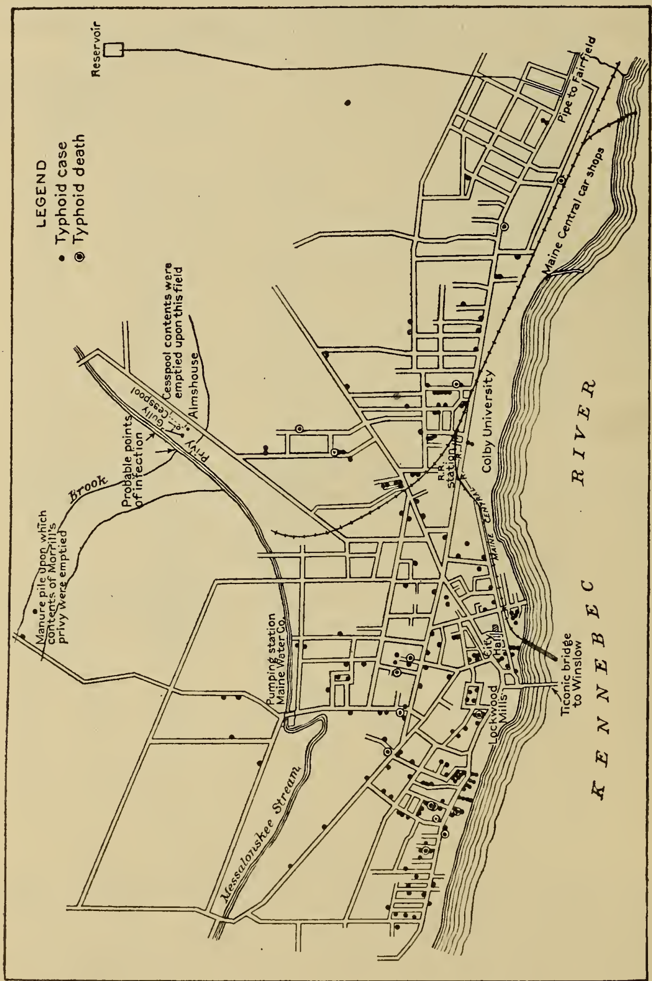


Fig. 16.—Map of Waterville, showing location of typhoid-fever cases.

the local conditions, but there was no evidence by which infection could be traced to any one of them.

Practically the only cause left for serious consideration was the public water supply of the city, the cause to which everything had directly pointed from the start. The general distribution of the cases over an extensive territory (the various parts of which had in common no possible causative factor other than the water supply), as shown in fig. 16, the chronological sequence of the cases, the fact that in practically every instance the patients gave a history of having regularly or occasionally drunk the water in question, the data obtained as to the relative prevalence of typhoid fever among users and nonusers of this water throughout the district, and, lastly, the discovery of the actual means by which the water had in all likelihood become infected—all these things indicated with as much positiveness as is possible with circumstantial evidence that it was the public water supply which was the general distributing agent of the infection.

For some time prior to the epidemic the character of the water supply of the city had been such as to lead to a quite general use of spring water, which was peddled by several dealers and purchased by most of those who could afford it. Well and cistern waters were used to a considerable extent. The water of the Kennebec River was used at a number of the mills and in some residences, especially in Winslow. * * * The morbidity rate for the epidemic period among those who used Messalonskee water exclusively was 42.00 per 1,000, while among those who used Messalonskee and some other water it was 14.55. If from the latter class there were excluded those who used water from the Kennebec River, which at Waterville is more or less polluted, the morbidity rate was found to be only 8.74. It is not to be expected that even in this group there would not be some who had occasionally used water from the Messalonskee supply, for, as a matter of fact, there were only five of the Waterville typhoid patients who did not remember to have used this water at any time before being taken ill.

The figures given show emphatically that the morbidity rate was highest among those who used the Messalonskee water exclusively and lowest among those who did not use it. It must be remembered, of course, that in any epidemic there are always some cases contracted by direct infection from other cases.

In Fairfield many of the houses were supplied by water piped from a spring by a private company. Not a single case developed among the takers of this water.

ORIGIN OF THE EPIDEMIC IN WATERVILLE.

As soon as it had become evident, not only from the exclusion of other possible causes but from certain well-marked positive features of the situation, that the epidemic was due to drinking water, a search for the actual origin of the infection of the public water supply was begun. Our attention naturally was first directed to Oakland, as this was the only settlement of considerable size on the Messalonskee River above Waterville. Inquiry among the Oakland physicians elicited the information that there had been but one case of typhoid fever there during the preceding summer and fall up to the beginning of the Waterville epidemic. This case had been imported from Winslow. An inspection of the premises where the patient resided convinced us that this could not possibly have been the starting point of the Waterville epidemic.

Very soon after the returns from the typhoid canvass began to come in, two possible sources of infection of the city water supply suggested themselves, and further investigation of these rendered it reasonably certain that each of them had offered abundant opportunity for the infection of the Messalonskee River.

The first of these foci was at the city almshouse, located in the suburbs of Waterville near the Messalonskee Stream, as shown in fig. 16. A typhoid-fever patient, Joe King, was admitted there on September 22, 1902. His attack was a mild one and confined him to bed for only a week. After leaving his bed, however, he remained five days longer at the almshouse, and during this latter period no attempt was made to disinfect either excreta or urine, which were deposited sometimes in a privy in the yard and sometimes in a water-closet which drained into a cesspool on the premises. On November 6, 1902, the privy and cesspool were cleaned and their contents spread upon the almshouse garden, the ground being frozen at the time. This was only a few hundred feet from the Messalonskee River, into which it drained. The slope of the intervening land was quite steep, and there was also a distinct gully which showed every sign of carrying a considerable and rapid flow of water across the garden and into the river after heavy rainfalls

The second focus of infection was found about a mile outside of Waterville, on the other side of the stream. During 1902 there had been five cases of typhoid fever in the families of J. W. Morrill and J. C. Morrill, who lived in farmhouses situated just across the road from each other. In all of these cases except one a prompt diagnosis had been made and the fecal dejecta of the patients had been disinfected and buried daily. In the second case of the series, however, the patient, Mrs. Studley, had been ill several weeks before the diagnosis of typhoid fever was made. During this time—i. e., from September 1 to September 25—no sufficient disinfection of stools was practiced, but they were emptied directly into a privy vault. Later on, at some time early in November, the contents of the privy were deposited in a field at a point where the land sloped abruptly toward a rivulet, about 200 feet away. After flowing about three-quarters of a mile over a very rapid course this brook emptied into the Messalonskee River almost directly opposite the almshouse above mentioned, about 1 mile upstream from the intake of the waterworks.

Thus, early in November, 1902, there were typhoid dejecta deposited upon the surface of the frozen ground at two points above and relatively near the pumping station of the Maine Water Company. In each case there was a sharp slope from the point where the dejecta were deposited—to the Messalonskee River in the one case and in the other to a small rill which emptied into the river. If these were the sources of infection, one would expect that from this time on the occurrence of typhoid fever among users of the Messalonskee water would bear an intimate relation to the rainfall. This relation was found to exist.

Fig. 15 shows the date of occurrence of the typhoid-fever cases, as determined by the date of physician's first visit—which was found to be in most cases the day when the patient took to bed—in Waterville, Fairfield, Winslow, and Benton, during the months of November, 1902, to February, 1903. The daily rainfall as recorded at Winslow is also shown. From this table it seems that during the early part of November there was only what may be considered a normal number of typhoid cases for this season. The first rainfall of considerable extent after infectious material was deposited in the fields was on November 12, when there was 0.30 inch. This was followed by a small group of cases toward the end of the month. The precipitation between November 23 and December 16 was snow, and this, gradually melting, probably washed small amounts of infectious matter into the river, which gave rise to the cases which developed up to about December 24. On the 16th day of December there was a precipitation of 0.56 inch, rain and snow, and nine days later, December 25, the real epidemic may be said to have begun, with the development of 6 cases of typhoid in Waterville and 1 in Fairfield. From December 25 to the end of the month there were 37 cases in Waterville, 5 in Winslow, 3 in Fairfield, and 1 in Benton, a total of 46 cases in one week.

The heaviest rainfall after the infectious material was deposited on the fields at Morrill's and the almshouse occurred on December 22, 1902, when there was a precipitation of 1.73 inches. Ten days after this, or almost exactly the same interval as after the rainfall of December 16, there developed the greatest number of cases of any day during the epidemic—namely, 13 cases in Waterville, 4 in Fairfield, and 1 in Winslow, a total of 18 cases.

Throughout the two months from the last third of November until the corresponding time in January, the relation between the rainfall and the typhoid cases was manifest, as shown in fig. 15. By the middle of January the typhoid bacilli in the two mentioned fields had either lost their vitality, or, what is more likely, had been pretty thoroughly washed away; for a rainfall of 1.40 inches on January 21 was not followed by any serious consequences. The constant relation between rainfall and the development of typhoid-fever cases was in itself a strong argument in favor of the agency of the public water supply in causing the epidemic.

In attempting to prove the case in court there were produced as witnesses the physician who attended the initial cases, the persons who spread the cesspool and privy contents on the fields, the inspector who had charge of the typhoid canvass, and the writers who collected the data and made the various investigations here referred to.

Although it is impossible in a paper of this length to give details of every piece of evidence presented, it may be well to take notice of a plausible objection to the above theory which might have been brought forward. During the early part of the epidemic Fairfield did not have as many cases in proportion to its population as did Waterville and Winslow, although supplied to a great extent by the same water. This was readily explained by a consideration of certain features of the distributing system. The reservoir of the system is located between Waterville and Fairfield and is supplied by a single pipe line, which branches off from the main connecting the two cities. From this arrangement it follows that when the consumption in Waterville and Winslow is less than is being pumped, both places receive water directly from the pumps, the excess going to the reservoir. When, on the other hand, the consumption is greater than the amount pumped, Fairfield and Benton receive water which has been stored in the reservoir. This fact was proved experimentally during our investigations by making several series of analyses at various points in the system. The older water in the reservoir, which had received some sedimentation, would be theoretically less infected with typhoid bacilli than the water pumped directly from the river; and theory, in these cases, certainly agreed with the facts. The facts also indicated that the use of the Kennebec River water at the time of the Colby University fire could not have been the cause of the epidemic or have materially contributed to it.

From the standpoint of the appraisal, the point to be established was not that the two cases mentioned were or were not the cause of the epidemic, but that the public water supply was or was not responsible for it. All the studies were incident to this main proposition.

TYPHOID FEVER IN AUGUSTA.

The methods used in studying the epidemic in Augusta were similar to those employed at Waterville. The house-to-house canvass was perhaps more thorough, but on the other hand it was made several months after the epidemic was over, when the facts were not so fresh in the minds of the people. The studies of the previous history of typhoid fever in Augusta were much more important than in the Waterville case, and th problem was much more complicated because the city had two sources of public water supply and the number of spring waters sold was greater.

PREVIOUS HISTORY OF TYPHOID FEVER IN AUGUSTA.

The Kennebec River water was introduced as a source of public water supply in the year 1887. For sixteen years before that time the average typhoid-fever death rate in Augusta had been 36.5 per 100,000; for sixteen years from 1888 to 1903 the average rate was 85.4. In 1898 there were a number of imported cases due to the Spanish war, and in 1903 occurred the great epidemic, which raised the death rate to 259 per 100,000. Excluding these two years, the average death rate during the period covering the use of the Kennebec River water was 66.5, or nearly double what it formerly had been.

At various times prior to 1903 typhoid fever had been prevalent in the city. Thus the board of health records for 1890 show that 75 cases of typhoid fever, besides a large amount of winter cholera, occurred that year. During the first thirteen weeks of 1891 69 cases were reported. There were no typhoid-fever records kept at Waterville at this time, so it can not be told whether or not the disease was due to infected sewage from that city. Typhoid fever was also prevalent during the winter and spring of 1892 and 1893. A report made by Capt. M. W. Wood, assistant surgeon, U. S. Army, on June 2, 1893, states that there were about 100 cases during the early part of that year.

Prior to the introduction of the Kennebec River water, typhoid fever in Augusta had been most common in the autumn, this being the normal season for the maximum of the disease, but after the installation of the supply from the Kennebec River the disease became most common during the winter months. This is an abnormal seasonal

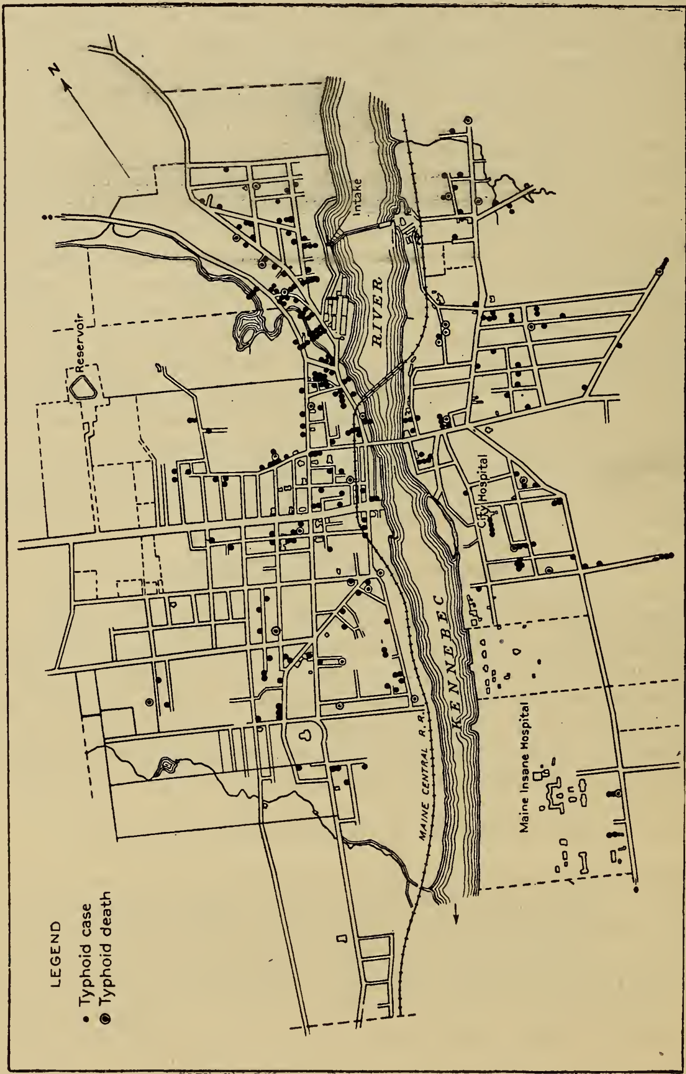


Fig. 17.—Map of Augusta, showing location of typhoid-fever cases.

distribution, and is most easily explained by assuming the maximum of the disease at Augusta to follow and to be caused by the normal autumnal maximum of typhoid fever in Waterville and the other cities which discharge their sewage into the river above Augusta.

Both the abundance of typhoid fever and its seasonal distribution since 1888 pointed strongly to the pollution and infection of the river water and would have been sufficient to condemn it as a source of supply even if the epidemic of 1902–3 had not occurred. * * *

As in the case of Waterville, all possible agencies of infection other than water were one by one excluded from consideration. The canvass showed that the morbidity rate for those cases on premises supplied with river water only was 53.7 per 1,000; on those supplied only with Devine water, 12.3; and on those supplied by wells, springs, or cisterns, 23.6. On those premises supplied with river water with or without supplementary sources the morbidity rate was 29.2, while on those which had no river water the rate was 20.6.

Classifying the cases according to the statements of the patients as to their use of water it was found that of 336 cases 76 per cent admitted that they had used the river water prior to being taken sick, while 24 per cent of them did not remember to have used the water. Of the latter class, however, 65 per cent lived on premises supplied with water from the river. Thus only about 8 per cent of the patients interviewed did not remember of having used the water and were not supplied with water from the river, at their homes. The conclusion that the river water caused the epidemic was inevitable. * * *

Population and typhoid fever at Augusta, Me., 1865 to 1903.

[From records in the city clerk's office.]

Year.	Estimated population.	Deaths.		Death rate per 100,000.		Typhoid per cent of total deaths.
		Total.	Typhoid.	Total.	Typhoid.	
1865	7,650	90	12	1,176.0	156.9	13.3
1866	7,675	26	1	338.8	130	3.9
1867	7,700	3	....	39.0	....	....
1868	7,750	1	....	12.9	....	....
1869	7,800	50	3	641.0	38.5	6.0
1870	7,808	99	4	1,268	51.2	4.1
1871	7,875	90	2	1,143	25.4	2.2
1872	7,925	95	6	1,198	75.7	6.3
1873	8,000	138	4	1,725	50.0	2.9
1874	8,075	80		991	....	....
1875	8,150	90	....	1,104	....	....
1876	8,225	131	6	1,584	73.0	4.6
1877	8,300	125	6	1,505	72.3	4.8
1878	8,425	128	6	1,520	71.2	4.7
1879	8,550	101	1	1,182	11.7	0.99
1880	8,665	115	....	1,327	....	....
1881	8,825	131	4	1,485	45.3	3.1
1882	9,000	102	1	1,134	11.1	0.98
1883	9,175	127	2	1,384	21.8	1.6
1884	9,400	80	....	851	....	....
1885	9,575	100	1	1,044	10.4	1.0
1886	9,775	143	6	1,462	61.4	4.2
1887	9,975	170	8	1,704	80.2	4.7
1888	10,175	151	4	1,484	39.3	2.7
1889	10,350	139	2	1,343	19.3	1.4
1890	10,527	182	16	1,729	152	8.8
1891	10,675	34	5	318	46.9	14.7
1892	10,825	315	7	2,910	64.7	2.2
1893	10,950	304	9	2,776	82.2	3.0
1894	11,075	322	6	2,906	54.2	1.9
1895	11,200	322	7	2,874	62.5	2.2
1896	11,325	316	11	2,790	97.1	3.5
1897	11,425	323	7	2,825	61.2	2.2
1898	11,525	257	20	2,230	173.5	7.8
1899	11,625	318	9	2,734	77.4	2.8
1900	11,683	289	4	2,472	34.2	1.4
1901	11,800	312	11	2,644	93.2	3.5
1902	11,875	304	6	2,560	50.3	2.0
1903	11,975	297	31	2,480	25.9	10.4

Chronological table of typhoid cases and deaths in Augusta, Me., between October, 1902, and May 1, 1903.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1			1	3	5+*1*	1+*1*+(1)	2
2		2+(1)	1	2+*1*	1	2+*1*	2+*1*
3			1	3	1	2+*1*	
4			1		1+*1*+(1)	1	1
5			1+*1*	*1*	5+*2*	2	
6			2+(1)	2	4+*3*	1	
7				1	3	2+*1*	
8					5+*1*	1	
9			1	2	4+*1*	4	1
10			1	1	2	1	
11			2		2		
12			2	4	3+*1*	3	
13			1		1		
14		1	1	3	5+*1*	2	
15		1		3	1		
16		1	1	2	3+*1*	1	
17			1	6+*3*	3	1	2
18			*1*	3	6+*1*	1	
19			1	3	(1)		
20			1	2	11+*1*	1+*1*	
21	*1*	1	2		5+*1*		
22		1	3	5+*1*	2	1	
23			*1*	3	2	3	
24		1	1	2+*1*	4	1	
25		3		6	3		
26		2	1	2	2	1	1
27				1		2	1
28				2	3	1	
29	1	*1*	3	2			
30			1	2		1	
31			1			1	
	1+*1*	14+*1*	32+*3*	65+7	89+*15*	38+*5*	10+*1*

Total for epidemic of 1902–3, 280. Numbers in italic indicate deaths. Numbers in parentheses indicate that date of case is uncertain.

Seasonal distribution of typhoid fever in Augusta.

BEFORE INTRODUCTION OF KENNEBEC RIVER WATER, 1865–1887.[a]

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average typhoid deaths	2	0	4	1	3	4	5	10	11	23	6	4
Average typhoid death rate per 100,000	1.06	0	2.12	0.53	1.59	2.12	2.65	5.30	5.83	12.21	3.18	2.12

AFTER INTRODUCTION OF KENNEBEC RIVER WATER, 1888–1903.[b]

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average typhoid deaths	15	25	28	15	6	4	4	1	15	13	9	20
Average typhoid death rate per 100,000	8.32	13.80	15.50	8.87	3.33	2.20	2.20	0.55	8.32	7.18	4.98	11.07

[a] Average population, 8,200.

[b] Average population, 11,300.

Distribution of typhoid fever in Augusta according to water service.

JANUARY 1, 1902, TO JANUARY 1, 1904.

Water supply used.	Number of persons.	Typhoid cases.	Typhoid deaths.	Morbidity per 100,000.
River only	2,980	160	16	5,370
Devine only	408	5	1	1,226
Wells, springs, and cisterns	1,441	34	5	2,359
River and Devine	295	7	2	2,373
River and wells, springs, and cisterns	3,671	105	6	2,860
Devine and springs or cisterns	39	0	0	0
Unclassified	12	0	0	0
	8,846	311	30	3,516

DURING THE EPIDEMIC, NOVEMBER 1, 1902, TO MAY 1, 1903.

Water supply used.	Number of persons.	Typhoid cases.	Typhoid deaths.	Morbidity per 100,000.
River only	2,980	134	15	4,500
Devine only	408	3	1	735
Wells, springs, and cisterns	1,441	28	5	1,940
River and Devine	295	7	2	2,373
River and wells, springs, and cisterns	3,671	88	6	2,400
Devine and springs or cisterns	39	0	0	0
Unclassified	12	0	0	0
	8,846	260	29	2,940

TYPHOID FEVER AT RICHMOND.

The typhoid-fever records of Richmond do not extend back of 1892. The city clerk's records for the years 1892 to 1903, however, indicate a death rate of 42 per 100,000 during these twelve years.

The typhoid-fever canvass of Richmond was less complete than that of Augusta; but of the 19 cases which occurred between January and April, 1903, all were said to have used the river water, and there is little reason to believe that these cases were due to any other cause.

DEATHS FROM TYPHOID IN KENNEBEC VALLEY, 1892-1903.

The following table gives the population and typhoid statistics of the principal towns in the Kennebec basin from 1892 to 1903, inclusive:

Deaths from typhoid fever in principal towns in Kennebec Valley, 1892–1903.

Town.	Population (U.S. census).		Deaths from typhoid fever.													
	1890.	1900.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	Total, 1892–1902.	Average per 100,000 1892–1902.	1903.
Madison	1,815	2,764	1	1	1	0	0	0	0	0	1	1	0	5	21	1
Skowhegan	5,068	5,180	2	1	1	2	0	0	0	1	0	0	0	7	12	1
Fairfield	3,510	3,878	0	2	1	0	0	2	0	1	0	1	1	8	19	6
Oakland	2,044	1,913	2	0	1	0	0	2	1	0	0	2	0	8	37	......
Newport	1,188	1,533	0	0	2	0	0	1	0	0	1	0	0	4	26	1
Pittsfield	2,503	2,891	0	0	1	3	2	0	2	3	1	1	1	14	48	1
Waterville	7,107	9,477	2	3	3	1	0	3	2	3	2	7	7	33	35	18
Augusta	10,527	11,683	9	7	6	5	5	5	19	8	4	9	4	81	66	31
Hallowell	3,181	2,714	0	1	2	1	2	1	1	0	0	4	2	14	45	1
Gardiner	5,491	5,501	0	2	0	0	1	2	2	2	1	2	1	13	22	1
Richmond	3,082	2,049	1	0	2	0	0	0	1	0	2	1	1	8	28	2

GAZETTEER OF RIVERS, LAKES, AND PONDS IN KENNEBEC BASIN.

By B. D. Wood.

This list of rivers, lakes, and ponds in the Kennebec drainage basin is based principally on data in the following reports:

Wells, Walter, The Water Power of Maine, 1869.

Swain, G. F., Tenth Census, vol. 16, pt. 1, 1885, pp. 83–89.

Pressey, H. A., Water Powers of the State of Maine: Water-Sup. and Irr. Paper No. 69, U. S. Geological Survey, 1902.

The best maps available have been consulted, including the topographic sheets of the United States Geological Survey, Hubbard's Map of Northern Maine, and Scarborough's Map of Southeastern Maine. (See fig. 1, p. 3.) All areas quoted from Wells are so marked; others are based on either the topographic sheets or surveys of the Geological Survey, as explained on page 14. Elevations above mean sea level are also from these last two sources.

Abagadassett River; rises in Gardiner Township, Kennebec County; flows southward into Kennebec River at Merrymeeting Bay; tidal in lower part of course.

Alder Pond; Tps. 2 and 3, R. 5, west-central Somerset County; outlet into Dead River.

Alder Stream; rises in Butler Pond, Lexington Township, Somerset County; flows southeastward into Gilman Pond, which discharges into Carrabassett River.

Alder Stream; rises in a small pond in East Moxie Township, eastern Somerset County; flows southwestward into Moxie Pond.

Alder Stream; rises in Alder Stream Mountain, in T. 3, R. 4, northern Franklin County; flows northeastward into North Branch of Dead River in the western part of Jim Pond Township.

Annabessacook Lake; Winthrop and Monmouth townships, Kennebec County; inlets from Lake Maranacook and Narrows and Wilsons ponds; outlet into Cobbosseecontee Pond; area 2.2 square miles; elevation, 174 feet. Called by Wells "South Pond."

Attean Pond; Attean Township, west-central Somerset County; inlet, Moose River; outlet, Moose River; area about 4.5 square miles; elevation. 1,158 feet. See pages 135–136 for further information regarding this pond.

Austin Ponds; Bald Mountain and Mayfield townships, Somerset County; outlet, Austin Stream; elevation of largest pond, 1,188 feet; five ponds, with a total water surface of approximately 3.2 square miles (Wells).

Austin Stream; rises in Austin Pond, in Bald Mountain Township, eastern Somerset County; flows southwestward, uniting with Kennebec River at Bingham; flows through Austin Ponds near headwaters; about 3.5 miles from its source it receives South Branch; the stream receives also a number of other brooks draining small ponds.

Baker Brook; rises in Tomhegan Township, eastern Somerset County; flows southeastward into Moosehead Lake.

Baker Pond; T. 5, R. 6, western Somerset County; outlet into Spencer Stream.

Baker Pond; Spaulding Township, eastern Somerset County; outlet, Baker Stream; receives drainage from Dimmick Ponds; elevation, 1,066 feet.

Baker Stream; rises in Baker Pond, Spaulding Township, eastern Somerset County; flows northward into Moxie Pond.

Barker Pond; Cornville Township, Somerset County; outlet into Moose Pond (to Sebasticook River); area, 0.35 square mile (Wells).

Barnard Pond; Eustis Township, northeastern Franklin County; outlet into Tim Brook.

Barrett Brook; rises in a small lake in Holeb Township, western Somerset County; flows northeastward into Moose River.

Bartlett Pond; T. 4, R. 5, western Somerset County; outlet into Spencer Stream.

Bassett Brook; rises in northern part of Moscow Township, Somerset County; flows southward and southwestward into Chase Stream.

Bean Brook; rises in western part of Forks Plantation, Somerset County; flows southwestward into Kennebec River.

Beans Pond; eastern Pleasant Ridge Township, Somerset County; outlet into Rowe Pond; elevation, about 1,240 feet.

Bear Brook; rises in northern part of Franklin County; flows southward, entering North Branch of Dead River just above Natanis Pond.

Bear Pond; Kibby and Alder Stream townships, northern Franklin County; outlet into North Branch of Dead River.

Beaver Brook; rises in Moores Pond, T. 4, R. 7, west-central Somerset County; flows northward into Horse Brook, a tributary of Moose River.

Beaverdam Brook; rises in a small pond in New Sharon Township, Franklin County; flows southwestward into Sandy River.

Beaver Pond; Rome Township, Kennebec County; inlet from Kidder Pond; outlet to Long Pond (to Messalonskee Lake); elevation, about 440 feet.

Belgrade Stream; rises in Long Pond, in western Belgrade Township, Kennebec County; flows southeastward, then northeastward, into Messalonskee Lake.

Benjamin Ponds (3); Attean Township, west-central Somerset County; outlet to Little Wood Pond (to Moose River).

Berry Pond; Wayne Township, Kennebec County; outlet into Dexter Pond (to Wilsons Pond).

Big Indian Pond; western Piscataquis County; outlet through Indian Stream to Indian Pond, Kennebec River; area, 0.4 square mile.

Bitter Brook; rises in small ponds in T. 3, R. 6, western Somerset County; flows southward into lake at head of Enchanted Stream.

Black Brook; rises on Mount Pisgah, central Franklin County; flows northwestward into South Branch of Dead River.

Black Brook Pond; T. 1, R. 5, eastern Somerset County; outlet to Kennebec River; area, 0.5 square mile.

Black Stream; rises in southeastern part of Cornville Township, Somerset County; flows southeastward into Sebleys Pond (to Carrabassett Stream).

Blanchard Pond; Alder Stream Township, northern Franklin County; outlet into North Branch of Dead River.

Bog Brook; rises in Jerusalem Township, Franklin County; flows northward into Dead River.

Bog Pond; T. 2, R. 6, northern Franklin County; inlet from Long Pond (Dead River); outlet to Lower Pond; elevation, 1,260 feet; one of the "Chain of Ponds."

Bog Stream; rises in northwestern part of Rome Township, Kennebec County; flows northward into Sandy River.

Bombazee Brook; rises in western part of Norridgewock Township, Somerset County; flows northeastward into Kennebec River.

Bond Brook; rises in eastern part of Manchester Township, Kennebec County; flows southeastward into Kennebec River at Augusta.

Boynton Pond; Embden Township, Somerset County; outlet into Fahi Pond.

Bradley Pond; Topsham Township, Sagadahoc County; outlet into Cathance River; elevation, about 100 feet.

Brandy Pond; northern part of Pleasant Ridge Township, Somerset County; outlet into Rowe Ponds (to Carrabassett River).

Brassua Lake; eastern Somerset County; inlets, Brassua Stream, Moose River, and Miseree Stream; outlet, Moose River; area 5.55 square miles; elevation, 1.043 feet. See page 133 for additional information regarding this pond.

Brassua Stream; rises in Luther Pond, Thorndike Township, central Somerset County; flows eastward and southward into Brassua Lake (to Moose River).

Buker Pond; Litchfield Township, Kennebec County; Inlet from Jimmy Pond; outlet to Sand Pond (to Cobbosseecontee Stream); elevation, about 175 feet.

Burnham Pond; western Piscataquis County; outlet to Indian Pond (to Kennebec River).

Butler Ponds; Flagstaff Township, western Somerset County; outlet into Flagstaff Lake.

Butler Pond; Lexington Township, Somerset County; outlet through Alder Stream and Gilman Pond to Carrabassett River; area, 0.4 square mile (Wells).

Carlton Pond; Readfield and Winthrop townships, Kennebec County; outlet to Narrows Pond (to Lake Annabessacook); area, 0.5 square mile; elevation, about 320 feet.

Carney Brook; rises in Decker Ponds, Carritunk Township, Somerset County; flows southward into Kennebec River.

Carrabassett River; rises in Crocker Township, eastern Franklin County; flows northward, eastward, and then southeastward about 45 miles, entering Kennebec River at North Anson; drainage area, 395 square miles; no large tributaries; few lakes and ponds; considerable fall, used to some extent for power. Gaging station near North Anson established in 1901; drainage area at this point, 340 square miles.

Carrabassett Stream; rises in Sebleys Pond, Canaan Township, Somerset County; flows southwestward into Kennebec River about 10 miles above Waterville.

Carry Brook; rises in Plymouth or Boyd Township, eastern Somerset County; flows southeastward into Moosehead Lake.

Carrying Place Ponds; central part of Somerset County; a group of eight ponds, three of which are of considerable size; the easternmost pond—area (Wells) about 1 square mile—has outlet to Kennebec River; the westernmost (area 1.3 square miles) to Dead River, elevation 1,250 feet (barometric); and the middle pond—area (Wells) about 0.3 square mile—through Rowe Ponds to Carrabassett River; three small ponds are connected with the middle pond and one drains to the western pond; one pond, probably the smallest of the group, is connected with the outlet stream of the middle pond. West Carry Pond has a dam giving a head of about 10 feet; used for storage of water for log driving. See page 140 for further information regarding West Carry Pond.

Cathance River; rises in northwestern part of Bowdoin Township, Sagadahoc County; flows, with abrupt turns, to the south, east, northeast, and then southeast and south into Kennebec River at Merrymeeting Bay.

Chain of Ponds; northern Franklin County; outlet into North Branch of Dead River; includes three large ponds and several smaller ones; area, three ponds (Natanis, Long, and Lower), approximately 5 square miles (Wells); elevation, 1,260 feet.

Chase Bog Pond; southwestern Spaulding Township, Somerset County; outlet to Chase Pond; elevation, about 1,480 feet.

Chase Pond; western part of Jim Pond Township, northeastern Franklin County; outlet into North Branch of Dead River.

Chase Ponds; northern part of Moscow Township, Somerset County; outlet into Austin Stream; elevation of largest pond, 1,356 feet.

Chase Stream; rises in Chase Pond, Moscow Township, Somerset County; flows southward into Austin Stream.

Chase Stream; rises in Chase Stream Pond, on the south boundary of Misery Township, eastern Somerset County; flows southeastward into Kennebec River.

Chase Stream Pond; south boundary of Misery Township, eastern Somerset County; outlet through Chase Stream to Kennebec River; area, approximately, 0.6 square mile (Wells).

Chesterville Ponds; Chesterville Township, Franklin County; outlet into Sandy River; area, total of six small ponds, 2 square miles (Wells).

China Lake; Vassalboro and China townships, Kennebec County; outlet into Sebasticook River; area, 6.1 square miles; elevation, 195 feet; used as source of municipal water supply for Waterville.

Churchill Stream; rises in a small lake in Misery Township, eastern Somerset County; flows northeastward into West Outlet of Moosehead Lake.

Clearwater Brook; rises in T. 2, R. 6, northern Franklin County; flows southwestward into Long Pond (to Dead River).

Clear Water Pond; Industry and Farmington townships, Franklin County; outlet into Sandy River; area, approximately, 1.75 square miles (Wells).

Cobbosseecontee Pond; Winthrop, Monmouth, Manchester, and West Gardiner townships, Kennebec County; inlets from Purgatory Ponds, Lake Annabessacook, and Richard Pond; outlet Cobbosseecontee River; area, 8.4 square miles; elevation, 171 feet; dam at outlet; used for storage of water for power.

Cobbosseecontee Stream; drains a group of lakes aggregating 19 square miles in area, lying from 5 to 15 miles west of Augusta; from the largest of the lakes, Cobbosseecontee Pond, which has an area of 8.4 square miles, the river flows southward, eastward, and then northeastward, entering Kennebec River at Gardiner; drainage area, 240 square miles; length from Cobbosseecontee Pond to Gardiner about 16 miles; river is extensively used for power and furnishes the municipal supply for the city of Gardiner; flow is very regular and furnishes one of the best examples of efficient storage in the country. Gaging station near Gardiner, maintained by Gardiner Water Power Company since 1890; drainage area at this point, 240 square miles.

Cochnewagon Pond; Monmouth Township, Kennebec County; outlet into Wilsons Pond (to Lake Annabessacook); area, about 1 square mile (Wells).

Cold Stream; rises in Cold Stream Pond, in Misery and Parlin Pond townships, central Somerset County; flows southwestward, then southeastward, into Kennebec River.

Cold Stream Pond; Misery and Parlin Pond townships, central Somerset County; outlet through Cold Stream into Kennebec River; area, approximately, 1.25 square miles (Wells).

Corinna Pond; Corinna Township, western Penobscot County; inlets from Dexter Pond; outlet into Sebasticook Lake; area, 0.6 square mile (Wells).

Dam Pond; Augusta Township, Kennebec County; outlet to Kennebec River through Sevenmile Brook; elevation, about 210 feet.

Dead River; formed by junction of North and South branches; North Branch rises in northern part of Franklin County and flows in a general southeasterly direction about 25 miles to Eustis, where it is joined by the South Branch; South Branch rises in mountains east of Rangeley Lakes and flows in a general northeasterly direction about 16 miles; from junction of two branches main stream flows eastward, northward, and then eastward about 40 miles to its junction with Kennebec River at The Forks, 24 miles below Moosehead Lake; total drainage area, 870 square miles; tributaries of North and South branches of no importance; tributaries of main river are Flagstaff Lake outlet, Carry Ponds outlet, and Spencer Stream (the largest); basin mostly wild and forested; many lakes and ponds, the most important being Flagstaff and Spring lakes, Carry and Spencer ponds. Gaging station at The Forks established in 1901; drainage area at this point, 870 square miles.

Dead River Pond; southern part of Dallas Township, west-central Franklin County; inlet from Saddleback Ponds; outlet South Branch of Dead River.

Dead River Pond; T. 1, R. 5, eastern Somerset County; outlet into Kennebec River.

Decker Brook; rises in southeastern part of Carritunk Township, eastern Somerset County; flows southeastward and eastward into Kennebec River.

Decker Ponds; Carritunk Township, Somerset County; outlet through Carney Brook to Kennebec River; elevation, about 1,260 feet.

Deer Pond; T. 4, R. 5, northwestern Somerset County; outlet to Flagstaff Lake (to Dead River).

Dexter Pond; Wayne Township, Kennebec County; outlet to Wilson Pond (to Lake Annabessacook); inlet from Berry Pond.

Dexter Ponds; Dexter Township, Penobscot County; outlet into Corinna Pond (to Sebasticook Lake); area, 3 square miles (Wells).

Dimmick Ponds (2); Spaulding Township, eastern Somerset County; inlet from Mountain Pond and several small brooks; outlet to Baker Pond; elevation of upper pond, about 1,460 feet; of lower pond, about 1,400 feet.

Double Head Pond; northern part of Litchfield Township, Kennebec County; one small inlet; outlet southward into Purgatory Pond; elevation, about 175 feet.

Doughnut Pond; eastern Carritunk Township, Somerset County; outlet into Robinson Pond; elevation, about 1,580 feet.

Dutton Pond; Kingfield Township, Franklin County; outlet into Carrabassett River.

East Brook; rises in Middle Carrying Place Pond, Somerset County; flows southward, uniting with Rowe Pond Stream to form Sandy Stream, a tributary of Carrabassett River.

Eastern River; rises in Pittston Township, southeastern Kennebec County; flows southwestward, entering Kennebec River in Dresden Township.

East Pond; Smithfield Township, Somerset County; outlet into North Pond (to Messalonskee Lake); area 2.6 square miles; elevation above sea, 260 feet.

Ellis Pond; T. 1, R. 6, eastern Somerset County; outlet into Kennebec River.

Ellis Pond; Belgrade and Oakland townships, Kennebec County; inlet from McGrath Pond; outlet to Great Pond; area, 0.9 square mile; elevation, 273 feet. Called by Wells "Richmond Pond."

Embden Pond; Embden Township, Somerset County; outlet through Mill Stream to Carrabassett River; area, 2.4 square miles; elevation, 422 feet.

Emerton Ponds; western Moscow Township, Somerset County; outlet into Kennebec River; elevation, about 500 feet.

Enchanted Stream; rises in T. 3, R. 6, western Somerset County; flows southeastward into Dead River.

Fahi Brook; rises in Fahi Pond, Embden Township, Somerset County; flows southward and southwestward into Mill Stream, a tributary of Carrabassett River.

Fahi Pond; Embden Township, Somerset County; outlet, Fahi Brook; area, 0.6 square mile (Wells); elevation, 413 feet.

Fall Brook; rises in southwestern part of Mayfield Township, Somerset County; flows southwestward and enters Kennebec River at Solon.

Fifteenmile Brook; rises in Lovejoy Pond, Albion Township, Kennebec County; flows northward into Sebasticook River.

Fish Pond; T. 1, R. 5, eastern Somerset County; outlet to Kennebec River.

Fish Pond; Thorndike Township, north-central Somerset County; outlet into Lower Churchill Stream.

Fitzgerald Pond; near Squaw Mountain, western Piscataquis County; outlet, Squaw Brook (to Moosehead Lake).

Flagstaff Lake; Flagstaff Township, western Somerset County; outlet to Dead River; area, 1.4 square miles; elevation, approximately, 1,100 feet (barometric); dam commands 12 feet head; used for storage of water for log driving. See pages 139–140 for additional information regarding this lake.

Gander Brook; rises in Dennes Township, west-central Somerset County; flows southeastward into Wood Pond (to Moose River).

Gardiner Pond; northwestern part of Wiscasset Township, Lincoln County; one small inlet; outlet stream flows northeastward through Gardiner Pond Swamp, thence northwestward and westward into Eastern River; elevation, 168 feet; area, 0.9 square mile. Called by Wells "Great Swamp in Dresden."

George Lake; Skowhegan and Canaan townships, Somerset County; outlet to Oak Pond and Carrabassett Stream.

Gilman Pond; Lexington and New Portland townships, Somerset County; outlet into Carrabassett River; inlets from several small ponds; area, 0.5 square mile (Wells).

Gold Brook; rises in Kibby Township, northern Franklin County; flows southwestward into North Branch of Dead River.

Great Pond; Rome and Belgrade townships, Kennebec County; inlets from North, Ellis, and McGrath ponds; outlet to Long Pond (to Messalonskee Lake); area, 12.7 square miles; elevation, 250 feet.

Greeley Pond; Augusta Township, Kennebec County; outlet to Togus River; elevation, about 160 feet.

Greeley Pond; Mount Vernon and Readfield townships, Kennebec County; outlet into Lake Maranacook; area, 1.1 square miles; elevation, 293 feet.

Greenbush Pond; Jim Pond Township, northern Franklin County; outlet to North Branch of Dead River.

Grindstone Pond; Kingfield Township, Franklin County; outlet to Tufts Pond.

Gulf Stream; rises in T. 1, R. 5, central Somerset County; flows southeastward into Dead River.

Gulf Stream; rises in Withee Pond, Mayfield Township, Somerset County; flows northwestward into Austin Stream.

Hall Pond; T. 5, R. 7, western Somerset County; outlet to Spencer Pond.

Hammond Brook; rises in Jerusalem Township, Franklin County; flows eastward into Carrabassett River.

Hancock Pond; Embden Township, Somerset County; outlet to Embden Pond; area, about 1 square mile (Wells); elevation, 520 feet.

Hayden Lake; Madison Township, Somerset County; outlet into Wesserunsett Stream; area, about 3 square miles (Wells). Called by Wells "Madison Pond."

Heald Pond; Moose River Plantation, western Somerset County; outlet to Moose River.

Heald Ponds (3); Spaulding Township, eastern Somerset County; outlet into Austin Stream; elevation of highest pond, 1,388 feet.

Heald Stream; rises in Heald Ponds, Spaulding Township, eastern Somerset County; flows southeastward into Austin Stream.

Henson Brook; rises in Jackman Township, western Somerset County; flows northward into Moose River.

Hicks Pond; Palmyra Township, Somerset County; outlet into Sebasticook Lake.

Higgins Stream; rises in Brighton Township, Somerset County; flows southeastward into Moose Pond (to Sebasticook River).

Holeb Pond; Holeb Township, western Somerset County; outlet into Moose River; area, approximately 2 square miles; elevation, about 1,133 feet. See pages 136–137 for further information regarding this pond.

Holway Brook; rises in southern part of Forks Plantation, Somerset County; flows southwestward into Kennebec River.

Horse Brook; rises in T. 3, R. 6, central Somerset County; flows northwestward into Moose River.

Horseshoe Pond; West Gardiner Township, Kennebec County; outlet into Cobbosseecontee River; elevation, 137 feet.

Horseshoe Pond; T. 2, R. 6, northern Franklin County; outlet into North Branch of Dead River; elevation, about 1,260 feet.

Horseshoe Pond; Tps. 3 and 4, R. 5, western Somerset County; outlet into Spencer Stream.

Houston Brook; rises in western part of Pleasant Ridge Township, Somerset County; flows southeastward, then northeastward, into Kennebec River.

Huston Brook; rises on southern slope of Mount Bigelow, western Somerset County; flows southward into Carrabassett River.

Indian Pond; Holeb Township, western Somerset County; outlet into Moose River.

Indian Pond; Lexington Township, Somerset County; outlet into Carrabassett River.

Indian Pond; St. Albans Township, Somerset County; outlet into Sebasticook River; area, approximately, 2.5 square miles (Wells).

Indian Pond; eastern Somerset County; inlets, West Outlet Ponds, Kennebec River, Indian Stream, and a number of small streams and ponds; outlet, Kennebec River; about 5 miles long in two levels, the first being about a mile long, and 932 feet above mean tide; a short stretch of "narrows," where a fall of about 5 feet occurs, connects the two levels; greater part of pond is 927 feet above tide; used for regulation of water in log driving; controlled by a dam at lower end; total area, 1.5 square miles.

Indian Stream; rises in Big Indian Pond, western Piscataquis County; flows northwestward into Indian Pond, Kennebec River.

Indian Stream; rises in the western part of T. 2, R. 6, northern Franklin County; flows eastward into Long Pond (to Dead River).

Ironbound Pond; Thorndike Township, north-central Somerset County; outlet into Lower Churchill Stream.

Iron Pond; T. 5, R. 6, western Somerset County; outlet into Spencer Stream.

Island Pond; T. 1, R. 6, eastern Somerset County; outlet into Kennebec River.

Jackson Brook; rises in southern part of Moscow Township, Somerset County; flows southwestward into Kennebec River.

Jackson Pond; Concord Township, Somerset County; outlet through Mill Stream to Martin Stream.

Jamies Pond; Manchester and Farmingdale townships, Kennebec County; outlet into Sanborn Pond (to Cobbosseecontee River); elevation, about 210 feet.

Jim Pond; northwestern Franklin County; outlet into North Branch of Dead River.

Jimmy Pond; Litchfield Township, Kennebec County; outlet into Buker Pond; elevation, about 175 feet.

Johnson Brook; rises in small ponds in northern part of Bingham Township, Somerset County; flows southward into Fall Brook, which enters the Kennebec.

Judkins Pond; Lexington Township, Somerset County; outlet through Gilman Pond to Carrabassett River; area, 0.75 square mile (Wells).

Kelly Brook; rises in central part of Forks Plantation, Somerset County; flows westward into Kennebec River.

Kibby Stream; rises in Kibby Township, northern Franklin County; flows southeastward into Spencer Stream, western Somerset County.

Kidder Pond; Vienna Township, Kennebec County; outlet into Beaver Pond; elevation, about 840 feet.

Knights Pond; Square Town Township, eastern Somerset County; outlet into Kennebec River; area, 0.2 square mile.

Lazy Tom Brook; rises in western Piscataquis County; flows southward into Roach River.

Lemon Stream; rises in Industry Township, Franklin County; flows southeastward into Sandy River.

Lily Pond; Freeman and New Portland townships, Franklin and Somerset counties; outlet into Carrabassett River.

Little Alder Stream; rises in extreme southern part of T. 2, R. 6, northern Franklin County; flows southeastward into Alder Stream, a tributary of North Branch of Dead River; receives drainage from Snow and Round Mountain ponds.

Little Austin Pond; Bald Mountain Township, eastern Somerset County; outlet into Austin Pond; elevation, 1,216 feet.

Little Big Wood Pond; Dennes Township, west-central Somerset County; inlet, Wood Stream; outlet into Little Wood Pond; area, approximately, 1.35 square miles (Wells).

Little Chase Pond; Moscow Township, Somerset County; outlet into Chase Stream; elevation, about 1,320 feet.

Little Heald Brook; rises on south side of Dimmick Mountain, Spaulding Township, eastern Somerset County; flows southeastward into Heald Stream.

Little Houston Brook; rises in western part of Concord Township, Somerset County; flows northeastward into Houston Brook.

Little Indian Pond; St. Albans Township, Somerset County; outlet into Indian Pond (to Sebasticook River); area, approximately, 0.35 square mile (Wells).

Little Indian Pond; Square Town Township, eastern Somerset County; outlet into Indian Stream (to Kennebec River).

Little Jim Pond; northeastern Franklin County, Jim Pond Township; outlet into Jim Pond.

Little Pocket Pond; T. 2, R. 6, northern Franklin County; outlet to Natanis Pond (to Dead River); elevation, 1,260 feet; one of the "Chain of Ponds."

Little Pond; Rome Township, Kennebec County; outlet to North Pond; combined area of Little and North ponds, 3.6 square miles; elevation, 253 feet.

Little Spencer Stream; rises in ponds in T. 4, R. 5, Somerset County; flows southward through Spencer Ponds into Spencer Stream.

Little Wood Pond; Attean Township, west-central Somerset County; inlets from Little Big Wood and Benjamin ponds; outlet to Wood Pond (to Moose River).

Locks Pond; Chesterville Township, Franklin County; outlet to Wilson Stream (to Sandy River).

Long Pond; T. 2, R. 6, northern Franklin County; inlets from Natanis and Pocket ponds and small brooks; outlet to Bog Pond (to Dead River); elevation, 1,260 feet; one of the "Chain of Ponds."

Long Pond; southwestern part of Hartland Township, Somerset County; outlet to Sebleys Pond (to Carrabassett Stream).

Long Pond; Jackman and Long Pond townships, north-central Somerset County; inlets, Moose River, Upper and Lower Churchill streams, and Parlin Stream; outlet, Moose River; area, approximately, 5 square miles; elevation, 1,155 feet; used for storage of water for log driving; dam commands a head of about 8 feet. See page 134 for additional information regarding this pond.

Long Pond; Parlin Pond Township, central Somerset County; outlet into Parlin Stream (to Moose River).

Long Pond; Rangeley and Dallas townships, west-central Franklin County; outlet into South Branch of Dead River.

Long Pond; Rome, Belgrade, and Mount Vernon townships, Kennebec County; inlets from Great Pond and several smaller ponds and brooks; outlet through Belgrade Stream to Messalonskee Lake; area, 4.2 square miles; elevation, 241 feet.

Long Pond; T. 1, R. 6, eastern Somerset County; outlet into Kennebec River.

Long Pond; T. 4, R. 5, western Somerset County; outlet into Spencer Stream.

Loon Pond; Litchfield Township, Kennebec County; outlet into Pleasant Pond (to Cobbosseecontee River); elevation, about 180 feet.

Lovejoy Pond; Albion Township, Kennebec County; outlet into Sebasticook River through Fifteenmile Brook; area, 0.7 square mile (Wells).

Lower Churchill Stream; rises in small ponds in Thorndike Township, north-central Somerset County; flows southeastward into Long Pond (to Moose River).

Lower Pond; T. 2, R. 6, northern Franklin County; inlet from Bog Pond, Dead River; outlet, North Branch of Dead River.

Luther Pond; Thorndike Township, central Somerset County; outlet, Brassua Stream (to Brassua Lake).

Maranacook Lake; Readfield and Winthrop townships, Kennebec County; inlets from Greeley and other small ponds; outlet to Lake Annabessacook; area, 2.5 square miles; elevation, 215 feet. Called by Wells "North Pond."

Martin Stream; rises in Concord Township, Somerset County; flows southeastward into Kennebec River.

McGrath Pond; Oakland and Belgrade townships, Kennebec County; inlets, small brooks; outlet into Ellis Pond; area, 0.7 square mile; elevation, 273 feet.

McGurdy Pond; Sharon and Chesterville townships, Franklin County; outlet into Sandy River.

McKinney Pond; Holeb Township, western Somerset County; outlet into Moose River.

Merrill Pond; Concord Township, Somerset County; outlet to Kennebec River; elevation, 343 feet.

Messalonskee Lake; Oakland, Belgrade, and Sidney townships, Kennebec County; principal inlet, Belgrade Stream; outlet, Messalonskee Stream; area, 5.4 square miles; elevation, 235 feet. Called by Wells "Snow Pond."

Messalonskee Stream; rises in Messalonskee Lake, Oakland Township, Kennebec County; flows northeastward, then southeastward, and enters the Kennebec at Waterville; length, about 42 miles; drainage area, 208 square miles; fed by extensive lakes, the aggregate water surface of which is between 25 and 30 square miles; flow very constant and fall large; extensively utilized for power. Called by Wells "Emerson Stream." Gaging station at Waterville, established 1903, discontinued 1906; drainage area at this point, 205 square miles.

Michael Stream; rises in southeastern part of Jerusalem township, Franklin County; flows eastward into Sandy Stream, a tributary of Carrabassett River.

Michael Stream; rises in Solon Township, Somerset County; flows southwestward into Kennebec River about 3 miles below Solon.

Mill Pond; Harmony Township, Somerset County; outlet into Moose Pond (to Sebasticook River); area, 1.1 square miles (Wells).

Mill Pond; Pleasant Ridge Township, Somerset County; outlet into Kennebec River; elevation, 1,149 feet.

Mill Stream; rises in Embden Pond, Emden Township, Somerset County; flows southeastward into Carrabassett River.

Mill Stream; rises in Jackson Lake, Concord Township, Somerset County; flows southward into Martin Stream, a tributary of the Kennebec.

Mill Stream; rises in Norridgewock Township, Somerset County; flows northeastward into Kennebec River at Norridgewock.

Mink Brook; rises in Mink Ponds; flows southward into Austin Stream.

Mink Brook; rises in western part of Forks Plantation, Somerset County; flows southwestward into Kennebec River.

Mink Ponds; Moscow Township, Somerset County; outlet to Austin Stream; elevation, 1,240 feet.

Miseree Pond; Misery Township, east-central Somerset County; outlet, Miseree Stream (to Brassua Lake); area, approximately; area 1.5 square miles (Wells).

Miseree Stream; rises in Miseree Pond, Misery Township, east-central Somerset County; flows northeastward into Brassua Lake (to Moose River).

Moores Pond; T. 4, R. 7, west-central Somerset County; outlet into Horse Brook, a tributary of Moose River.

Moose Brook; rises in eastern Somerset County; flows southeastward into Moosehead lake.

Moose Brook; rises in T. 4, R. 7, central Somerset County; flows northwestward into Horse Brook, a tributary of Moose River.

Moosehead Lake; eastern Somerset and western Piscataquis counties; inlets, Roach and Moose rivers and a number of small streams; outlet, Kennebec River; area, about 115 square miles; drainage area at mouth, 1,240 square miles; elevation, 1,026 feet; used for storage of water for water power and log driving; dam commands a head of 7.5 feet over entire surface; navigable by steamboats from end to end. See pages 132–133 for information regarding storage capacity, etc.

Moose Pond; Harmony and Hartland townships, Somerset County; outlet to Sebasticook River; inlets from Mill, Starbird, and Stafford ponds and a number of brooks; area, approximately, 9.50 square miles (Wells).

Moose Pond; Mount Vernon Township, Kennebec County; outlet into Belgrade Stream, a tributary of Messalonskee Lake; elevation, about 400 feet.

Moose River; rises in the extreme northern part of Franklin County; flows in a general direction a little north of east and enters Moosehead Lake from the west; length, about 70 miles; drainage area, 680 square miles. The stream passes through Attean, Wood, and Long ponds and Brassua Lake, and receives the drainage from a large number of small ponds well scattered over the basin. Gaging station near Rockwood, established 1902; drainage area at this point, 680 square miles.

Mosquito Pond; Forks Plantation, eastern Somerset County; outlet into Moxie Pond.

Moxie Pond; East Moxie Township, eastern Somerset County; inlets, Alder, Sandy, and Baker streams and several small ponds and brooks; outlet through Moxie Stream into Kennebec River; area, 2.6 square miles; drainage area at outlet, 80 square miles; elevation, 965 feet; commanded by a dam affording a head of 9 feet; used for water storage for log driving. See page 138 for fuller information.

Moxie Stream; rises in Moxie Pond, eastern Somerset County; flows westward into Kennebec River; has a fall of 370 feet in 4 miles, one fall of 95 feet being nearly vertical; total drainage area, 92 square miles.

Mountain Pond; central Somerset County; outlet northeastward into Dimmick Ponds; elevation, 2,000 feet.

Muddy River; rises in Topsham Township, Sagadahoc County; flows northeastward into Kennebec River at Merrymeeting Bay.

Mud Pond; Embden Township, Somerset County; outlet into Fahi Pond.

Mud Pond; Thorndike Township, north-central Somerset County; outlet into Lower Churchill Stream.

Muskrat Pond; Thorndike Township, north-central Somerset County; outlet into Lower Churchill Stream.

Narrows Pond; Winthrop Township, Kennebec County; inlet from Carlton Pond; outlet into Lake Annabessacook; area, 0.8 square mile; elevation, approximately, 180 feet.

Natanis Pond; T. 2, R. 6, northern Franklin County; inlet from Round Pond, Dead River; outlet into Long Pond (to Dead River); elevation, 1,260 feet; one of the "Chain of Ponds."

Nehumkeag Pond; Pittston Township, Kennebec County; outlet into Kennebec River.

Nequasset Brook; rises in Dresden Township, Lincoln County; flows southward through Nequasset Pond into Kennebec River at Woolwich, opposite Bath.

Nequasset Pond; Woolwich Township, Sagadahoc County; inlets from Nequasset and other brooks; outlet into Kennebec River; area, 0.6 square mile; elevation, 18 feet.

Nokomis Pond; Palmyra Township, Somerset County, and Newport Township, Penobscot County; outlet into Sebasticook Lake.

Norcross Brook; rises in western Piscataquis County; flows northwestward into Moosehead Lake.

Norcross Pond; Chesterville Township, Franklin County; outlet into Sandy River; area, 0.35 square mile (Wells).

North Boundary Pond; T. 3, R. 6, northern Franklin County; outlet into North Branch of Dead River; elevation, 2,061+ feet.

North Pond; on boundary between Smithfield and Mercer townships, Somerset County, and Rome Township, Kennebec County; inlets from East and Little ponds; outlet into Great Pond; combined area of North and Little ponds, 3.6 square miles; elevation, 253 feet.

North Pond; Temple and Wilton townships, Franklin County; outlet into Sandy River; area, about 1 square mile (Wells).

North Pond; Chesterville Township, Franklin County; outlet into Sandy River; area, about 1 square mile (Wells?).

It is not certain to which of the three foregoing ponds Wells referred in his list of ponds connected with Sandy River. As shown on Scarborough's map of southwestern Maine, they differ little in size from Norcross Pond, the area of which is given as 0.35 square mile.

Northwest Boundary Pond; T. 3, R. 6, northern Franklin County; outlet into North Branch of Dead River; elevation, 2,061 feet.

Oak Pond; Skowhegan Township, Somerset County; inlet from Lake George; outlet into Carrabassett Stream.

Otter Pond; T. 2, R. 6, northern Franklin County; outlet into North Branch of Dead River; elevation, 1,360+ feet.

Otter Ponds; central Somerset County; outlet into Kennebec River; area, two ponds, 0.5 square mile.

Palmyra Ponds; Palmyra Township, Somerset County; outlet into Sebasticook River; combined water surface, two ponds, 0.6 square mile (Wells).

Parker Pond; T. 3, R. 5, western Somerset County; outlet to Spencer Stream.

Parlin Pond; Parlin Pond Township, central Somerset County; outlet, Parlin Stream to Long Pond (to Moose River); area, approximately, 2.75 square miles (Wells)

Parlin Stream; rises in Parlin Pond, Parlin Pond Township, central Somerset County; flows northeastward into Long Pond (to Moose River).

Pattee Pond; Winslow Township, Kennebec County; outlet into Sebasticook River; area, 0.85 square mile (Wells); elevation, about 120 feet.

Perham Stream; rises in Mount Abraham Township, Franklin County; flows southward and southwestward into Sandy River.

Pierce Pond; central Somerset County; outlet into Kennebec River; area, about 2.3 square miles; drainage area at outlet, 18 square miles; elevation, about 1,125 feet (barometric); dam commands a head of about 10 feet; used for storage of water for log driving. See page 139 for additional information regarding this pond.

Pleasant Pond; Litchfield Township, Kennebec County, and Richmond Township, Sagadahoc County; inlets from a number of small brooks; outlet into Cobbosseecontee River; area, 1.1 square miles; elevation, 137 feet.

Pleasant Pond; central Somerset County; outlet, Pleasant Pond Stream; area, 1.6 square miles; drainage area at mouth, 5.9 square miles; elevation, 1,265 feet; 780 feet fall to Kennebec River in a distance of about 3.5 miles.

Pleasant Pond Stream; rises in Pleasant Pond, central Somerset County; flows southwestward into Kennebec River.

Plymouth Ponds; Plymouth Township, Penobscot County; inlets from Skinner Pond and small brooks; outlet into Sebasticook Lake; area, about 3 square miles (Wells).

Pocket Pond; T. 2, R. 6, northern Franklin County; outlet into Long Pond (to Dead River); elevation, 1,260 feet; one of the "Chain of Ponds."

Ponco Ponds; Moose River Plantation, western Somerset County; outlet to Moose River.

Poplar Brook; rises in Jerusalem Township, Franklin County; flows southwestward into Carrabassett River at Carrabassett.

Prong Pond; western part of Piscataquis County; outlet to Moosehead Lake.

Purgatory Ponds (3); Litchfield Township, Kennebec County; inlet from Sand Pond; outlet into Cobbosseecontee River; area of largest pond, 0.7 square mile; elevation, 175 feet.

Rapid Stream; rises in Jerusalem Township, Franklin County; flows southeastward, then northeastward, into Carrabassett River at Kingfield.

Redington Brook; rises in Redington Ponds, central Franklin County; flows southwestward, then northwestward, into South Branch of Dead River.

Redington Ponds; Redington Township, central Franklin County; outlet into Redington Brook.

Reed Brook; rises on Mount Bigelow, Bigelow Township, western Somerset County; flows northward into Dead River.

Richard Pond; Winthrop Township, Kennebec County; inlet from Shed Pond; outlet into Cobbosseecontee Pond; elevation, about 180 feet.

Ritt Brook; rises in southwestern part of Mayfield Township, Somerset County; flows northward into South Branch of Austin Stream.

Roach Ponds; west-central Piscataquis County; outlet through Roach River to Moosehead Lake; three ponds, known as Upper, Middle, and Lower, with areas, respectively, of 1.5, 1.5, and 5 square miles; dam on each pond; used for log driving. See pages 137–138 for further description of these ponds.

Roach River; receives headwaters from slopes of Boardman and White Cap mountains, west-central Piscataquis County; flows northwestward through a series of three ponds, and empties into Spencer Bay on east side of Moosehead Lake; length, about 20 miles; drainage basin completely forested; total area at mouth, 120 square miles; no large tributary streams; three ponds of importance—Upper, Middle, and Lower Roach ponds; river utilized for log driving; gaging station at Roach River established in 1901; drainage area at this point, 85 square miles.

Robinson Pond; on boundary between Carritunk and Spaulding townships, eastern Somerset County; inlet from Doughnut Pond; outlet into Pleasant Pond Stream; elevation, 1,478 feet.

Robinson Pond Outlet; rises in Robinson Pond; flows northwestward through Deer Bog and Moores Bog to Pleasant Pond Stream.

Rock Pond; Tps. 5 and 6, Rs. 6 and 7, western Somerset County; outlet into Spencer Stream.

Rogers Pond; St. Albans Township, Somerset County; outlet into Little Indian Pond (to Sebasticook River); area, about 0.9 square mile (Wells).

Rolling Dam Brook; rises in southern part of Gardiner Township, Kennebec County; flows northeastward and eastward into Kennebec River near Gardiner.

Round Mountain Lake; Alder Stream Township, northern Franklin County; outlet to Little Alder Stream.

Round Pond; T. 2, R. 6, northern Franklin County; inlet, Dead River; outlet to Natanis Pond, Dead River; elevation, about 1,260 feet; one of the "Chain of Ponds."

Rowe Ponds; Pleasant Ridge Township, Somerset County; outlet through Sandy Stream to Carrabassett River; inlets from several small ponds; area of largest pond, 0.7 square mile (Wells); elevation, 1,209 feet.

Rowe Pond Stream; rises in Rowe Ponds, Pleasant Ridge Township, Somerset County; flows southwestward, uniting with East Brook to form Sandy Stream, a tributary of Carrabassett River.

Saddleback Ponds (2); near Saddleback Mountain, in northern part of Sandy River Township, west-central Franklin County; outlet to Dead River Pond (to South Branch of Dead River).

Sally Pond; Dennes Township, western Somerset County; outlet into Moose River.

Salmon Stream; rises in Johnson Mountain, T. 2, R. 6, central Somerset County; flows southeastward into Dead River.

Sanborn Pond; Manchester and Farmingdale townships, Kennebec County; outlet into Cobbosseecontee River; inlet from Jamies Pond; elevation, about 180 feet.

Sand Pond; Chesterville Township, Franklin County; outlet into Wilson Stream (to Sandy River).

Sand Pond; Litchfield Township, Kennebec County; inlet from Buker Pond; outlet into Purgatory Pond (to Cobbosseecontee River); elevation, about 175 feet.

Sandy Pond; Embden Township, Somerset County; outlet to Fahi Pond; area, 0.4 square mile (Wells); elevation, 413 feet.

Sandy Pond; Freedom Township, Waldo County; outlet to Sebasticook River; area, about 0.9 square mile (Wells).

Sandy River; rises in western part of Franklin County in the hilly region east of Rangeley Lake; flows southeastward about 32 miles, then northeastward 17 miles, entering the Kennebec about 3 miles below Madison; drainage area, 670 square miles; no large tributaries or ponds; total fall about 1,600 feet, mostly in upper part of basin. Gaging station near Madison established in 1904; drainage area at this point, 650 square miles.

Sandy River Ponds; Sandy River Township, Franklin County; outlet, Sandy River; area, four ponds, 1 square mile (Wells).

Sandy Stream; rises in East Moxie Township, eastern Somerset County; flows southwestward into Moxie Pond.

Sandy Stream; rises in Highland Township, Somerset County, being formed by union of East Brook and Rowe Pond, which drain Middle Carrying Place and Rowe ponds; flows southward through Gilman Pond to Carrabassett River.

Savage Pond; northwestern Cornville Township, Somerset County; outlet to Wesserunsett Stream.

Sebasticook Lake; Newport Township, Penobscot County; inlets from Stetson and Corinna ponds and several small brooks; outlet to Sebasticook River; area, approximately 7.5 square miles (Wells). Called by Wells "Newport Pond."

Sebasticook River; rises in ponds in southeastern Somerset and western Penobscot counties; flows in general southwestward 45 miles to Kennebec River at Winslow, opposite Waterville; drainage area, 970 square miles; many tributary ponds, covering in all about 50 square miles; total fall, about 170 feet; extensively used for power.

Sebleys Pond; Canaan and Pittsfield townships, Somerset County; outlet to Kennebec River through Carrabassett Stream

Sevenmile Brook; rises in Spectacle, Tolman, and Dam ponds, Augusta Township, Kennebec County; flows northwestward into Kennebec River about 5 miles above Augusta.

Shallow Pond; Jim Pond Township, northeastern Franklin County; outlet into North Branch of Dead River.

Shed Pond; Manchester Township, Kennebec County; outlet into Richard Pond (to Cobbosseecontee Pond); elevation, about 320 feet.

Skinner Pond; Dixmont Township. Penobscot County; outlet to Plymouth Ponds (to Sebasticook Lake); area, approximately 0.7 square mile (Wells).

Smith Pond; Parlin Pond and Misery townships, central Somerset County; outlet to Parlin Stream.

Snow Pond; Alder Stream Township, northern Franklin County; outlet into Little Alder Stream.

Socatean River; rises in Plymouth or Boyd Township, eastern Somerset County; flows southeastward into Moosehead Lake.

South Boundary Pond; T. 3, R. 6, northern Franklin County; outlet into North Branch of Dead River; elevation, 2,061+ feet.

Spectacle Pond; T. 4, R. 5, western Somerset County; outlet into Kibby Stream, a branch of Spencer Stream.

Spectacle Pond; Vassalboro and Augusta townships, Kennebec County; outlet into Kennebec River through Sevenmile Brook.

Spencer Pond; western Piscataquis County; outlet into Moosehead Lake; three small inlets; area, approximately, 1.5 square miles (Wells).

Spencer Ponds; Tps. 3 and 4, Rs. 5 and 6, western Somerset County; inlet drains several small ponds; outlet into Spencer Stream; area, approximately, 2.6 square miles; elevation, about 1,150 feet (barometric); dam commands 16-foot head when pond is filled; used for log sluicing. See page 141 for additional information regarding these ponds.

Spencer Stream; rises in T. 5, R. 6, western Somerset County; flows southwestward, then southeastward, into Dead River; many tributary ponds; largest are Spencer Ponds, which reach Spencer Stream by way of Little Spencer Stream. See page — for additional information regarding this stream.

Spring Lake; T. 3, R. 4, western Somerset County; outlet to Dead River; area, approximately, 1.1 square miles; elevation, about 1,260 feet above mean sea level (barometric) and 260 feet above Dead River. Called by Wells "Long Lake." See page 140 for additional information regarding this lake.

Spruce Pond; Lexington Township, Somerset County; outlet through Witham Brook to Embden Pond; area, 0.35 square mile (Wells).

Squaw Brook; rises in Fitzgerald Pond, near Squaw Mountain, western Piscataquis County; flows southeastward into Moosehead Lake.

Stafford Pond; Hartland Township, Somerset County; outlet to Moose Pond (to Sebasticook River); area, 0.35 square mile (Wells).

Starbird Pond; Hartland Township, Somerset County; outlet to Moose Pond (to Sebasticook River); area, 0.35 square mile (Wells).

Stetson Pond; Stetson Township, Penobscot County; outlet to Sebasticook Lake; area, about 2.5 square miles (Wells).

Stony Brook; rises in central part of Highland Township, Somerset County; flows southeastward into Sandy Stream, a tributary of Carrabassett River.

Stony Brook; rises in Thorndike Township, central Somerset County; flows southeastward into Moose River.

Stratton Brook; rises on Mount Bigelow, T. 4, R. 3, Franklin County; flows westward and northwestward into South Branch of Dead River.

Tee Pond; Jim Pond Township, northern Franklin County; outlet to Tim Brook (to North Branch of Dead River).

Ten Thousand Acre Ponds; southern boundary of Misery township, eastern Somerset County; outlet to Chase Stream (to Kennebec River).

Three-Cornered Pond; Augusta Township, Kennebec County; outlet to Togus Ponds; elevation, 198 feet.

Threemile Pond; China and Windsor townships, Kennebec County; outlet to Weber Pond (to Kennebec River); area, 1.6 square miles; elevation, 180 feet.

Tim Brook; rises in Tim Pond, northern Franklin County; flows northeastward into North Branch of Dead River.

Tim Pond; western Eustis Township, northern Franklin County; outlet, Tim Brook.

Tobey Brook; rises about 1½ miles southeast of South Norridgewock, Somerset County; flows southward into Martin Stream (into Kennebec River).

Toby Ponds; T. 5, R. 7, western Somerset County; outlet to Moose River.

Togus Ponds; Augusta Township, Kennebec County; outlet through Togus River to Kennebec River; area, 1 square mile; elevation, 188 feet. Called by Wells "Woromotogus Pond."

Togus River; rises in Togus Ponds, Augusta, Township, Kennebec County; flows southwestward into Kennebec River at Randolph, opposite Gardiner.

Tolman Pond; Augusta Township, Kennebec County; outlet into Kennebec River through Sevenmile Brook; elevation, about 210 feet.

Tom Fletcher Stream; rises in Brassua Township, central Somerset County; flows southeastward into Moose River.

Tomhegan Pond; Middlesex Grant Township, eastern Somerset County; outlet into Moosehead Lake through Tomhegan Stream; area, approximately, 0.75 square mile (Wells).

Tomhegan Stream; rises in T. 2, R. 3, eastern Somerset County; flows southeastward into Moosehead Lake.

Trout Pond; west-central Piscataquis County; outlet into Middle Roach Pond.

Tufts Pond; Kingfield Township, Franklin County; outlet to Carrabassett River; area, 0.5 square mile (Wells).

Turner Brook; rises in southern part of Madison Township, Somerset County; flows southeastward into Kennebec River between Norridgewock and Skowhegan.

Turner Pond; Moscow Township, Somerset County; outlet into Kennebec River; elevation, about 500 feet.

Turner Pond (2); Forsythe and Holeb townships, western Somerset County; outlet into Holeb Pond.

Unity (Twenty-five Mile) Pond; Unity, Burnham, and Troy townships, Waldo County; outlet to Sebasticook River; area, approximately, 4.25 square miles (Wells).

Upper Churchill Stream; rises in Bog Pond, Bald Mountains, Moose River Plantation, western Somerset County; flows southeastward into Long Pond (to Moose River).

Viles Pond; Jim Pond Township, northern Franklin County; outlet into North Branch of Dead River.

Ward Pond; Sidney Township, Kennebec County; outlet to Messalonskee Lake; elevation, about 340 feet.

Weber Pond; Vassalboro Township, Kennebec County; inlet from Threemile Pond; outlet to Kennebec River; area, 1.9 square miles; elevation, 138 feet.

Weeks Pond; Brighton Township, Somerset County; outlet to Wesserunsett Stream.

Welhern Pond; Eustis Township, northeastern Franklin County; outlet to Tim Brook.

Wentworth Pond; Solon and Athens townships, Somerset County; outlet into Wesserunsett Stream; area, with Bakers Pond (unnamed on available maps), approximately 1 square mile (Wells).

Wesserunsett Stream; rises in Weeks Pond, Brighton Township, Somerset County; flows southward into Kennebec River in Skowhegan Township; drainage area (Tenth Census), 167 square miles; a rapid stream, affording numerous sites for power, many of which are unimproved; flow not very constant.

West Brook; rises in Highland Township, Somerset County; flows eastward into Sandy Stream, a tributary of Carrabassett River.

West Outlet Ponds; eastern Somerset County; outlet from Moosehead Lake to Indian Pond (to Kennebec River); area of three ponds, approximately, 1.25 square miles (Wells).

Weymouth Pond; Corinna Township, Penobscot County; outlet to Little Indian Pond (to Sebasticook River); area, 0.4 square mile (Wells).

Whipple Pond; T. 5, R. 7, western Somerset County; outlet into Spencer Pond.

Whitcomb Brook; rises in western part of Moscow Township, Somerset County; flows southwestward into Kennebec River.

Whites Pond; Palmyra Township, Somerset County; outlet into Palmyra Ponds (to Sebasticook River.)

Williams Stream; rises in eastern Somerset County; flows southeastward into Moosehead Lake.

Wilsons Pond; Wayne and Monmouth townships, Kennebec County; inlets from Dexter and Cochnewagon ponds; outlet into Lake Annabessacook; area, about 0.9 square mile (Wells).

Wilsons Pond; T. 1, R. 5, eastern Somerset County; outlet into Kennebec River.

Wilson Stream; rises in Temple Township, Franklin County; flows southeastward, then northeastward into Sandy River.

Wilton Pond; Wilton Township, Franklin County; outlet to Sandy River; area, approximately, 1.25 square miles (Wells). This is probably the pond called "Wilsons" by Wells.

Witham Brook; rises in Spruce Pond, Lexington Township, Somerset County; flows southeastward into Embden Pond.

Withee Pond; southwestern part of Mayfield Township, Somerset County; outlet through Gulf Stream to Austin Stream; elevation, about 1,360 feet.

Wood Pond; Attean Township, west-central Somerset County; inlets, Gander Breok, Wood Stream, and Moose River; receives also drainage from a number of small ponds; outlet, Moose River; area, about 3.3 square miles; elevation, 1,158 feet. See pages 135–136 for further information regarding this pond.

Wood Stream; rises in Forsythe Township, western Somerset County; flows southeastward through Little Big Wood and Little Wood ponds into Wood Pond (to Moose River).

Wyman Pond; Brighton Township, Somerset County; outlet into Wesserunsett Stream; area, 0.75 square mile (Wells).

Youngs Pond; northeastern Pleasant Ridge Township, Somerset County; outlet into Kennebec River; elevation, about 1,300 feet.

INDEX.

For general description of rivers, ponds, and lakes see Gazetteer, pp. 212-227.

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[Water-Supply Paper No. 198.]

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Water-Supply and Irrigation Paper No. 198

Series { L, Quality of Water, 21
M, General Hydrographic Investigations, 23
N, Water Power, 13

DEPARTMENT OF THE INTERIOR

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CHARLES D. WALCOTT, DIRECTOR

WATER RESOURCES

OF THE

KENNEBEC RIVER BASIN, MAINE

BY

H. K. BARROWS

WITH A SECTION ON THE

QUALITY OF KENNEBEC RIVER WATER

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WASHINGTON

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